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OPTIMIZED AERODYNAMIC DESIGN PROCESS FOR SUBSONIC TRANSPORT WING FITTED WITH WINGLETS

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SUMMARY

The aerodynamic design of a wind-tunnel model of a wing representative of that of a subsonic jet transport aircraft, fitted with winglets, has been performed using two recently developed optimal wing-design computer programs. Both potential flow codes use a vortex lattice representation of the near-field of the aerodynamic surfaces for determination of the required mean camber surfaces for minimum induced drag, and both codes use far-field induced drag minimization procedures to obtain the required spanloads. One code uses a discrete vortex wake model for this far-field drag computation, while the second uses a 2-D advanced panel wake model. Wing camber shapes for the two codes are very similar, but the resulting winglet camber shapes differ widely. Design techniques and considerations for these two wind-tunnel models are detailed herein, inlcuding a description of the necessary modifications of the design geometry to format it for use by a numerically controlled (NC) machine for the actual model construction.

INTRODUCTION

The current emphasis on improving the fuel efficiency at cruise of existing transport aircraft, and designing future generations of aircraft with even further increases in fuel efficiency, has resulted in the consideration of several new, novel aircraft configurations. Examples are the so-called box plane studied in references 1 and 2, the joined wing concept of reference 3, and winglets as discussed in reference 4. Further model studies of improved transport performance may be found in references 5-7. These concepts generally use nonplanar lifting surfaces to reduce the induced drag.

Recently a vortex lattice wing-design computer program has been developed, described in reference 8, which computes for subcritical flow, using thin wing potential flow theory, the wing camber surfaces for one or two interacting planforms for minimum induced drag. The user specifies the configuration geometry in planview, dihedral angles, the reference wing area and span, the subsonic design Mach number and design lift coefficient. The desired

chordwise loading function must also be specified on each planform. The camber shape is computed directly which will achieve the desired lift, have zero pitching moment (for two planforms) and will have minimum induced drag. This program may be used as a preliminary design tool for constructing wind-tunnel models to investigate the above-mentioned new aircraft configurations, so long as the design is subcritical. Further, for configurations which are subcritical, this program is relatively inexpensive to run compared to more sophisticated transonic codes which use iterative techniques to achieve optimal solutions.

However, there is concern that the vortex lattice theory could lead to errors in design shape in the vicinity of a change in wing dihedral angle (refs. 9 and 10). This has lead to the development of an advanced panel far-field wake model (ref. 11) where the wing wakes are broken into flat panels, and where the wake vortex strength is assumed to vary linearly on each wake panel. This theory has been shown to be more accurate than a discrete vortex wake model (ref. 11). This wake model has been extended to obtain the bound circulation and spanload distributions for minimum induced drag for use in the vortex lattice wing-design code of reference 8. Extensions of this theory, as well as sample results from the modified design code, have been given in reference 12. Design results to date (refs. 12 and 13) have shown that the original code (ref. 8) and the modified code (ref. 12) give identical results except where there is a change in wing dihedral.

In an attempt to determine the capabilities of both of these subcritical design codes, two wind-tunnel models are currently being designed for a single transport type wing fitted with winglets. The design point is $M = 0.8$, $C_L = 0.5$, and it is expected that there will be only a very limited region of slightly supercritical flow. The wing planform for both models is the same as that used in one of the sample results given in reference 8. The winglet planforms for both models are identical; this planform has been chosen using the recommendations of reference 4. The two computer programs give essentially identical camber shapes on the wing, but yield widely different shapes on the winglet. Hence, a single wing model is to be built, using the results of the modified code, while both winglet models are to be constructed and tested for comparison. This report details the considerations used to design these two models. In particular, the data required for using a numerically controlled machine to cut the model surfaces is discussed.

SYMBOLS

A	wing aspect ratio, defined as b^2/S
a	chordwise pressure loading parameter
b	wing span, cm (in.), equal to 71.491 cm (28.146 in.)
c	local chord, m (ft)
$\bar{c}$	mean chord, m (ft), equal to 0.2136 m (0.7008 ft)
C_p	pressure coefficient
ΔC_p	pressure difference coefficient
c_t	wing tip chord, cm (in.), equal to 8.113 cm (3.194 in.)
C_B	wing root bending moment coefficient
C_D	induced drag coefficient
C_L	lift coefficient
C_m	pitching moment coefficient about origin of body axis coordinate system shown in figure 1
M	Mach number
q	dynamic pressure, Pa (lb/ft^2)
S	projected wing area, m^2 (ft^2), equal to 0.30595 m^2 (3.293 ft^2)
t	local semithickness, cm (in.)
X	streamwise body axis coordinate, cm (in.)
x	streamwise coordinate measured from local wing leading edge, cm (in.)
Y	spanwise coordinate, cm (in.)
Z	vertical coordinate, cm (in.)
z	coordinate normal to local wing chordplane, cm (in.)
α	angle of attack, radians (degrees)
ϵ	nondimensional chordwise coordinate
η	nondimensional spanwise coordinate
ϕ	dihedral angle, radians (degrees)

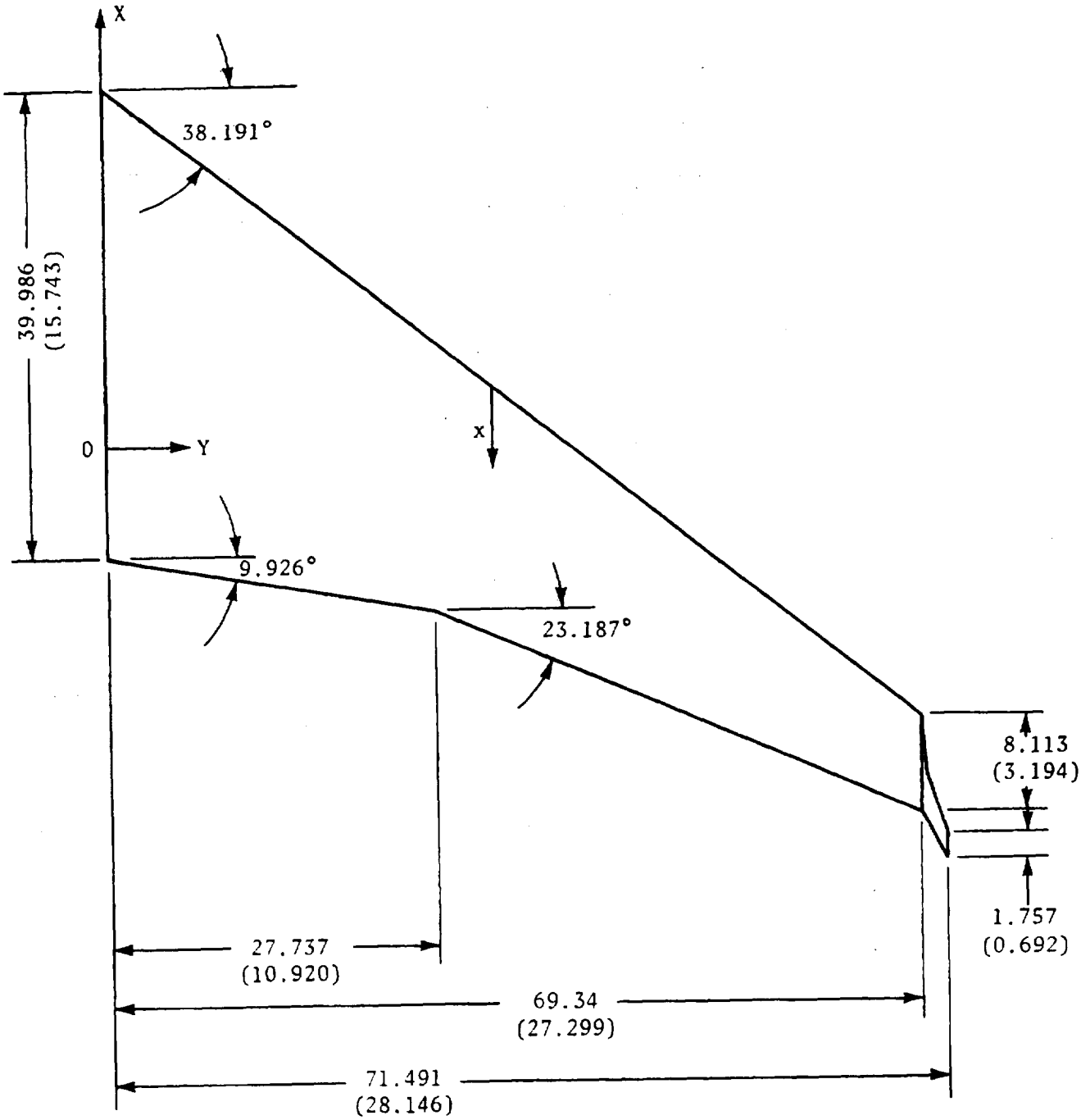

Figure 1. Planview of wing-winglet model. Dimensions are given in cm (in.); wing has 6° dihedral and winglet has 77.5° dihedral.

MODEL WING-WINGLET DESCRIPTION

The current wind-tunnel wing-winglet models have been designed for use on an existing fuselage model, which has been used in a series of tests of previous wing-winglet models (ref. 5) and high-aspect ratio wing tests (ref. 7). The wing planform (fig. 1) was the same as that used in the single planform example of reference 8; however, the winglet plan view (fig. 2) has been altered to conform to recommended winglet-design criteria given in reference 4. The wing has been scaled so its projected span equals the span of the configurations tested in reference 5, using the same fuselage model. This wing planform is representative of current subsonic jet transport wings. Model wing projected area was 0.30595 m^2 (3.293 ft^2), and mean chord equaled 0.2136 m (0.7008 ft). The design point chosen was a Mach number of 0.8 and a lift coefficient of 0.5. These were chosen as being representative of current jet transports. Also it was felt desirable to attempt a model design at the highest values of Mach number and lift coefficient which seemed advisable. It is likely that for the model size chosen (b = 1.430 m), the maximum Mach number achievable in the NASA-Langley 7 × 10 foot high-speed tunnel where the model is to be tested will be no greater than M = 0.8 (ref. 14). This design point was chosen such that once the wing thickness distribution was superimposed on the designed camber shape, the flow over the wing and winglet would be everywhere subcritical. Wing and winglet leading edge sweeps were 38.19 and 35.28 degrees, respectively. The wing had a trailing edge break at 0.388 times the total configuration projected semispan and a constant 6 degrees of dihedral. The winglet length was 0.143 times the projected span of the wing alone. The winglet trailing edge was straight, with a leading edge break at 0.25 times the winglet height. The lower 25 percent of the winglet was swept 61.6 degrees. The upper 75 percent of the winglet had a leading edge sweep of 35.28 degrees which, when projected down to the wing tip, intersected the tip at 0.65 times the wing tip chord. The winglet dihedral was 77.5 degrees (see fig. 2). These values, as well as the eight percent maximum thickness type NACA 64A008 thickness distribution (ref. 15), all followed the recommendations of reference 4. A design using a constant chordwise

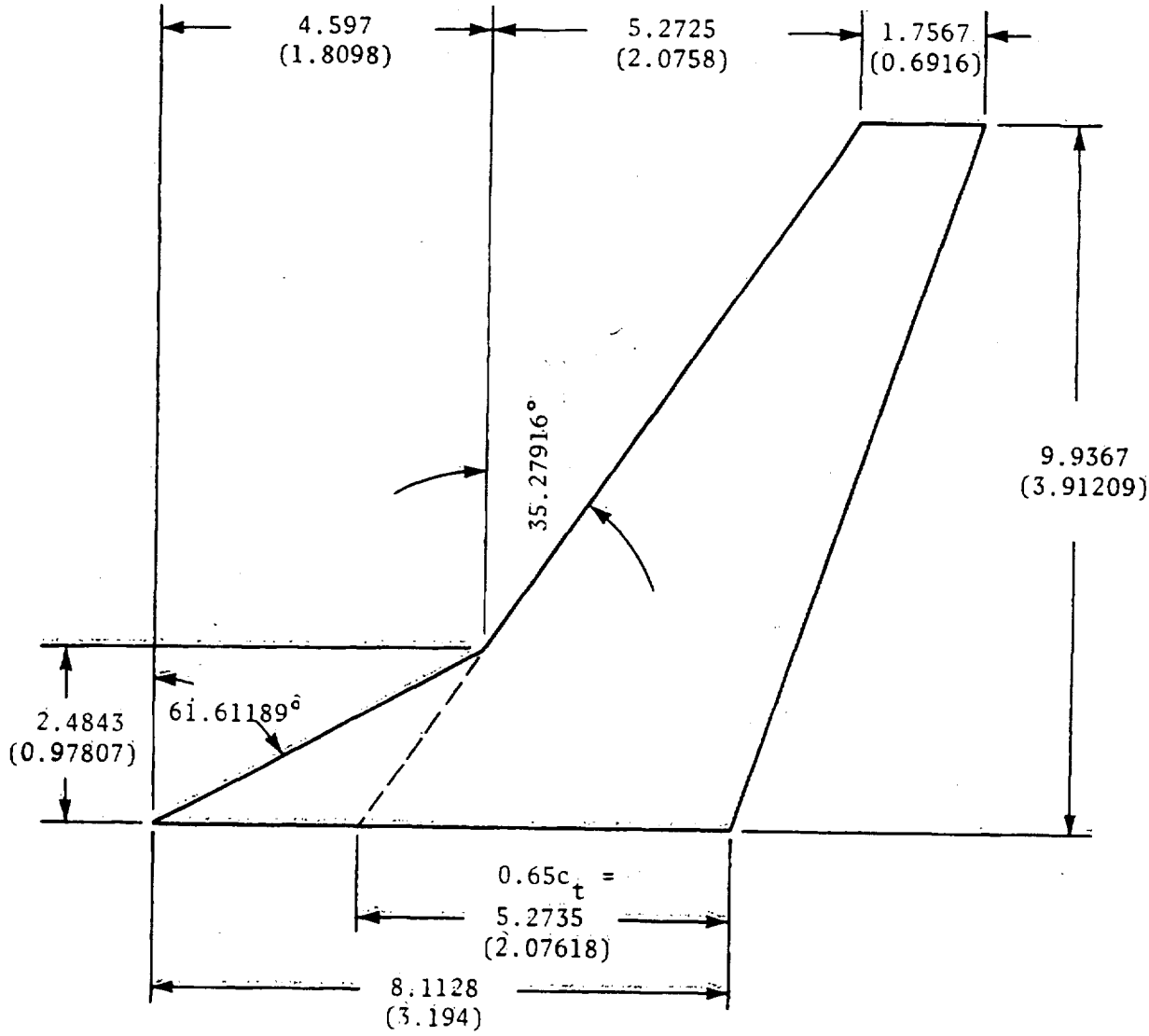

Figure 2. Winglet plan view. Dimensions are given in cm (in.).

loading function (a = 1.0) like that used in reference 8 has been chosen.

CAMBER SURFACE DESIGN

Once the model planform, scale, and design point had been chosen, the two inviscid design codes of references 8 and 12 were used to obtain the camber shapes predicted by each which would lead to minimum induced drag. In both codes, a vortex lattice near-field representation of 18 chordwise vortices by 21 spanwise was chosen. This was close to the maximum number of near-field singularities allowable in either code. The design camber shape was insensitive to these values over the limited range of 18 × 21 to 16 × 25. The adopted lattice layout led to three camber lines on the winglet: one below the leading edge break and two above the break. The original design code was modified to use 96 discrete vortex unknowns, rather than the usual 100, in the Trefftz plane to determine the optimum span load. This was done to duplicate as nearly as possible the true wake shape for the wing-winglet model, given the restriction of equally spaced wake vortices (ref. 8). The modified code (ref. 12) used 50 wake panels having a cosine spacing. Thirty-five panels were used on the wing and 15 on the winglet. It is believed that the calculations for the modified code were more accurate, based upon results shown in references 11 and 12. The computed induced drag for the original code was 0.009034, while for the modified code using the advanced panel wake model C_D = 0.008141. This is inconsistent with results of reference 11, where the discrete vortex model was seen to underpredict the induced drag, but is believed to be due to inaccuracies in the discrete vortex wake shape. Further study as to the reason for these C_D values is required.

The necessary input data cards for both computer programs, as well as the resultant outputs are shown in Appendix A. The different optimum spanloads from these two programs are plotted in figure 3. They differ most significantly on the winglet and near the wing tip. Examples of the computed optimum camber shapes are shown in figure 4. Again, the differences in the two methods are confined to the region near the winglet on the wing and on the winglet itself. Similar results have been

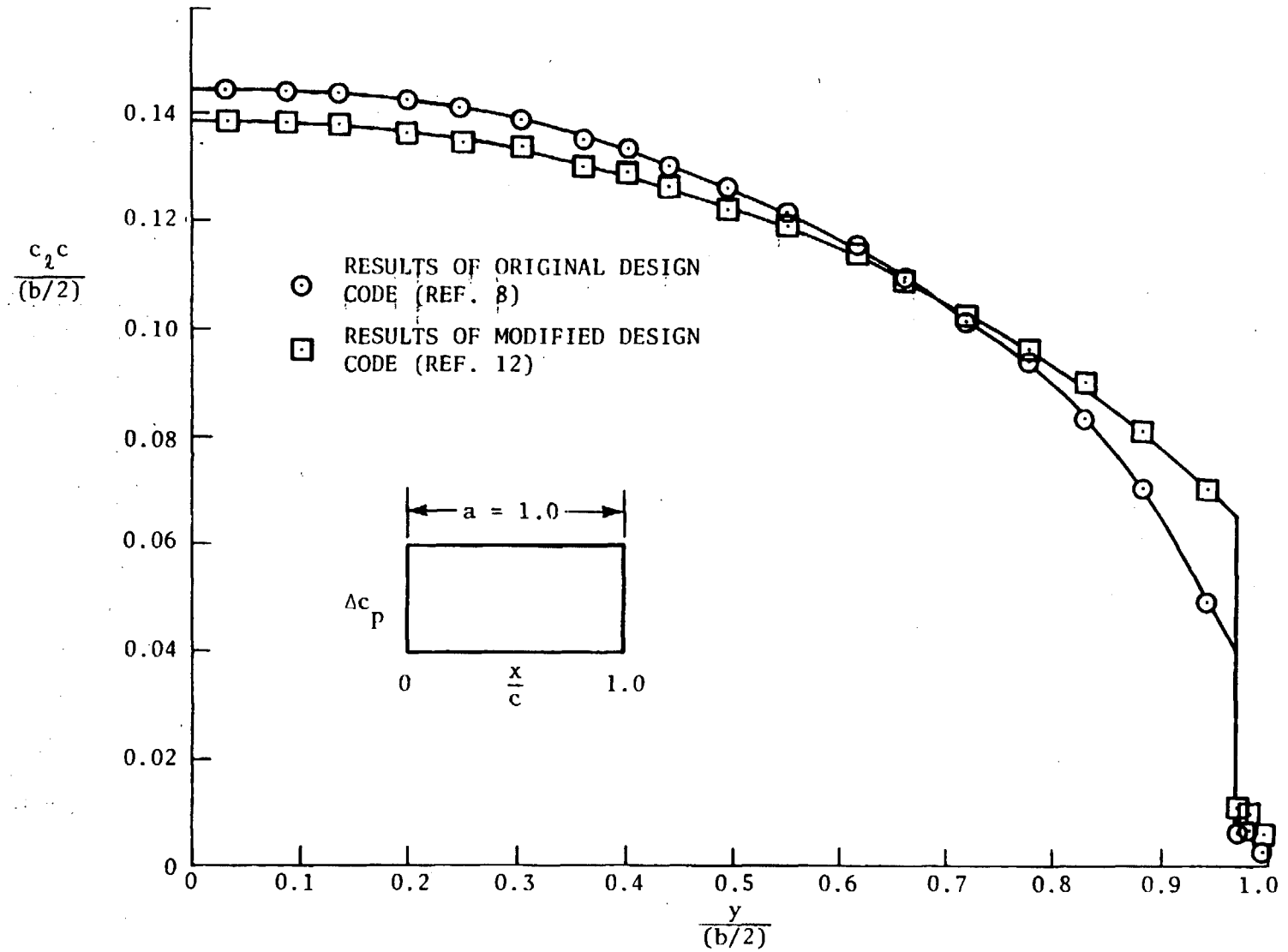

Figure 3. Spanload distribution for wing-winglet model designed for minimum induced drag at M = 0.8, C_L = 0.5, a = 1.0.

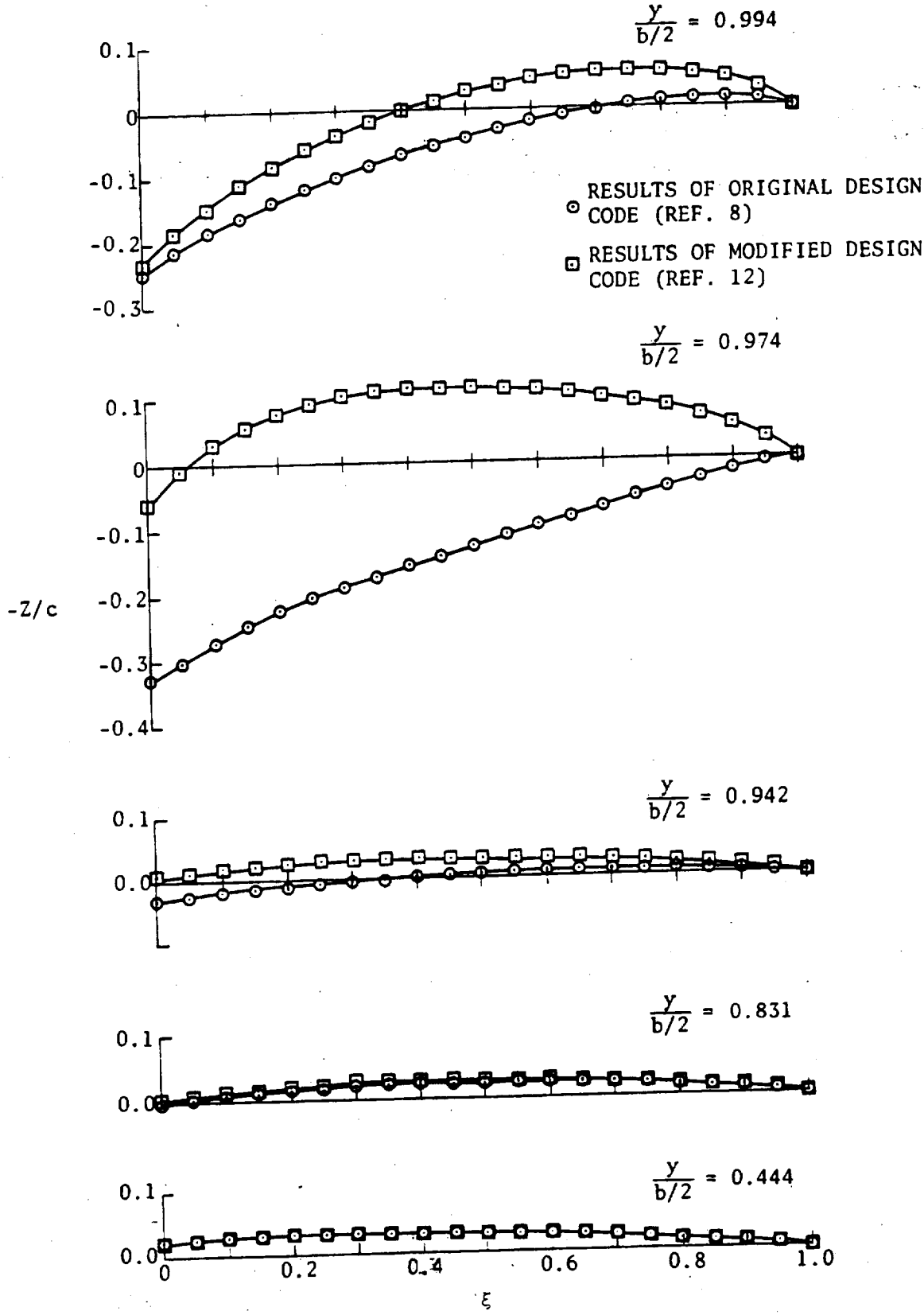

Figure 4. Camber shapes for wing-winglet model designed for minimum induced drag at M = 0.8, C_L = 0.5, a = 1.0.

presented previously in reference 12 for a similar wing-winglet configuration, having a different winglet planform.

Once these design results had been obtained, and the NACA 64A008 thickness distribution chosen, the three-dimensional potential flow code of reference 16 was utilized to check for any locally supercritical regions on the designed wing-winglet. All of the design camber surface Z/c values were rescaled by multiplying by the cosine of the local dihedral to obtain local airfoil cambers perpendicular to the plane of the wing or winglet. Also, the local η values had to be recomputed in terms of the fractional wing-winglet peripheral length. These input data were in a simplified namelist format developed under contract for NASA/Langley Research Center (LaRC) by the Computer Sciences Corporation. The resultant panel geometry for the modified code design is shown in figure 5, and sample chordwise pressure plots are shown in figure 6. There was a region of nearly constant ΔC_p, over about the middle 70 percent of the local chord, with the pressure difference falling to zero at the trailing edge, and with a slight rise at the leading edge. The minimum pressure coefficient computed on the configuration designed using the original code (ref. 8) was -0.5675, while the minimum found on the shape computed using the modified code (ref. 12) was -0.7461. These values occurred near the winglet root. The value of C_p for sonic conditions at M = 0.8 is -0.6910, so it is felt that there will not be any regions of supercritical flow on the model designed using the original code (ref. 8). The modified code model will have a small region of slightly supercritical flow near the root of the winglet. It is also noted that the chosen design point, C_L = 0.5 and M = 0.8, is as high as possible without appreciably violating the assumption of subcritical flow.

This summarizes the aerodynamic considerations undertaken for the design of the current models. The more complete design process, such as described in reference 17, was not undertaken, largely because these models must be tested to discover how useful the computer codes of references 8 and 12 are as design tools. The wing-winglet configuration chosen should provide a good test, while at the same time yielding information about which version of the design code is preferable. More sophisticated analysis programs modeling the flow over complete aircraft configurations,

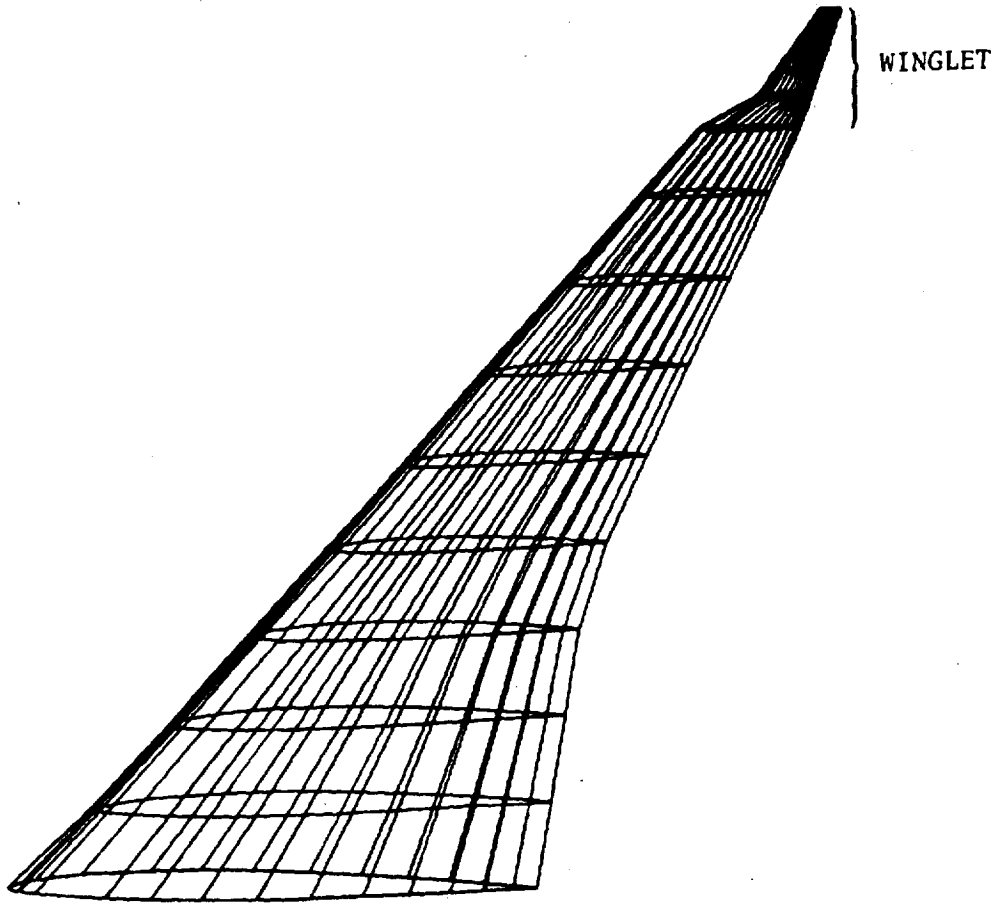

Figure 5. Perspective view of wing-winglet panel geometry for code of reference 16; design results of reference 12.

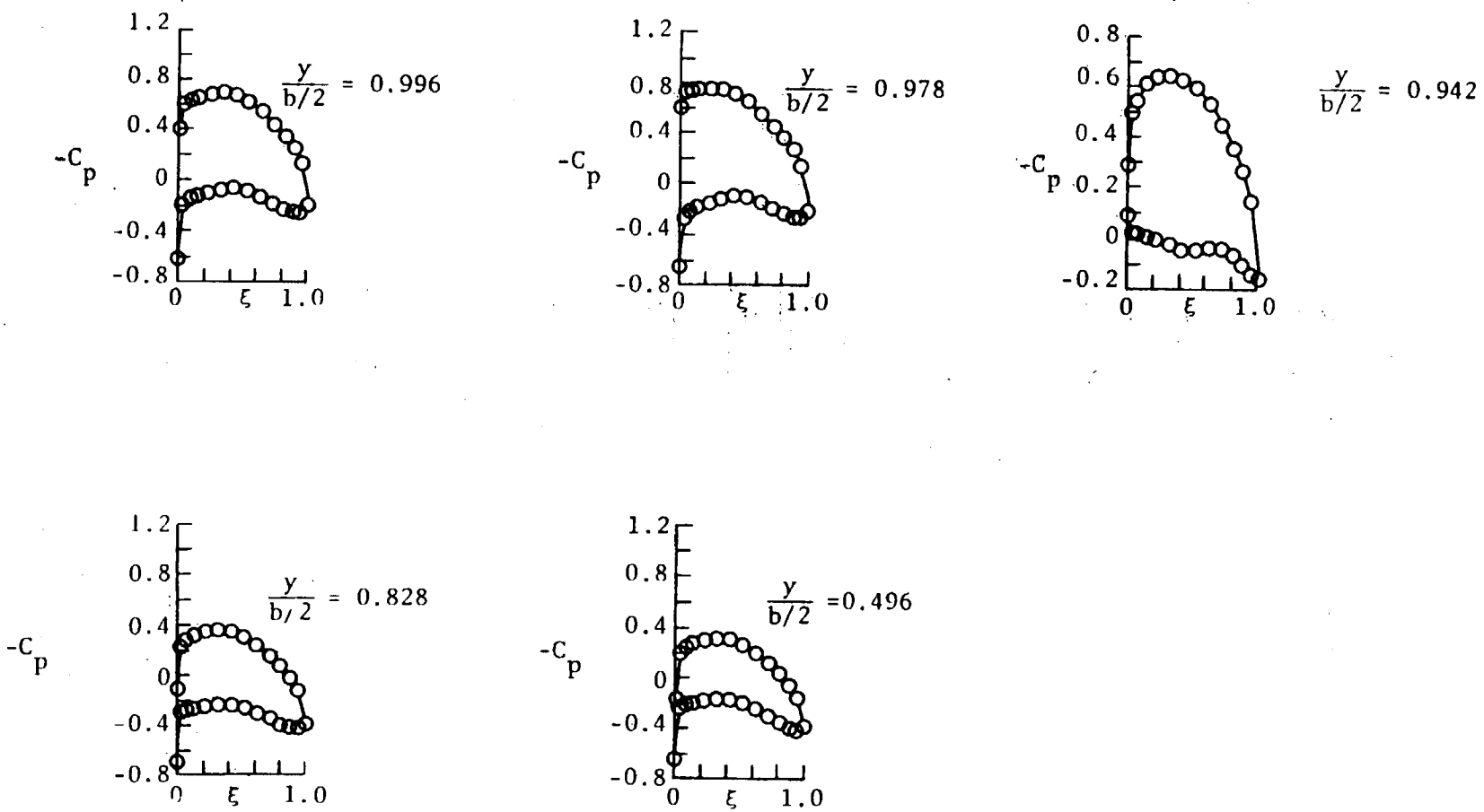

Figure 6. Iless code chordwise pressure coefficient distributions for wing-winglet designed by method of reference 12.

including the effects of bodies, thickness, shocks, and even viscous effects, as described in references 18 and 19 would be expected to yield more accurate performance predictions. The recent aerodynamic optimization programs of references 20 and 21 should allow determination of optimum configurations including the above nonideal effects.

DESIGN DETAILS

Several other basic model design specifications and criteria have been developed relating to the construction of the model itself. Since the wing cambers from both codes differed only in the region immediately adjacent to the wing-winglet junction, it was decided to build only one wing model, using the camber values from the modified design code (ref 12). The wing and winglet models will be cut using numerically controlled machining from steel, since the test dynamic pressures will be in the vicinity of q = 34,100 Pa (720 lb/ft^2) at the design point (ref. 14). The wing and all winglet models will be cut separately so all surface coordinates will be measured perpendicular to the plane of the wing or the winglets. Four separate pairs of winglets will be constructed. These winglets will bolt to the model wing tip. Two pairs of winglets will be machined having the camber shape computed using the original design code (ref. 8). One of these winglet pairs will have static pressure ports at the 12.5 and 42.5 percent peripheral distance stations. Upper surface pressures will be sensed on one winglet; lower surface pressure taps will be placed at the same x/c values on the other winglet. The pressure tubing will join to larger tubing in the wing itself in a cutout cavity in the wing near the wing-winglet junction. The second winglet pair will have no pressure instrumentation, but will be fitted with full span 0.2 c trailing edge flaps which bolt to the winglet. The flat deflection angles will be 0°, ±2°, ±4°. The remaining two pairs of winglet models will be constructed having the camber shape of the modified design code (ref. 12); one pair will be fitted with pressure taps, while the second pair will be fitted with flaps, as described above. The wing model will have two chordwise rows of static pressure taps, at the 31 and 74 percent peripheral distance locations. All pressure tubing will be carried inside the fuselage to three scannivalves. The region of the junction between wing and winglets

will be formed by handwork using templates. The wing root region will be beveled to allow it to bolt to the fuselage strongback. Also, if feasible, the wing root region will be gaged to allow measurement of the wing root bending moment.

NUMERICALLY CONTROLLED MACHINE INPUT

Finally, a description is now given of the steps necessary to prepare an input deck to prepare a tape for use on the numerically controlled machine (type TX-23). A small computer program was written to rescale the camber shapes to be perpendicular to the local ϕ, by multiplying by cos ϕ. Then the t/c values were added to get upper and lower surface values, which were then multiplied by the local chord value in inches. This yielded a set of upper and lower surface coordinates, in inches, measured perpendicular to the wing or winglet planes. Next, these coordinates were extrapolated linearly to obtain coordinates at the wing root and tip, the location of the trailing edge break on the wing, the winglet root and tip, and the location of the leading edge break on the winglet. These values were then punched on cards in a 7F10.6 format. The airfoil shapes were also plotted using LaRC subroutine INFOPLT. The program listing and output are shown in Appendix B, along with the final decks to cut the wing and the winglet. Both decks shown were for the modified design code results (ref. 12). Also included are the N/C machine input deck preparation instructions. Examples of the wing and winglet airfoil sections are shown in figure 7.

The NASA/LaRC model shop personnel can supply sample data checks which aid in building an input deck for numerically controlled machining of a general wing. Categories I and II (see TX-23 Input, Appendix B) must be largely defined by the engineer, while items III, IV, and V are fairly standard and any needed changes in these cards can be made by the personnel in the model shop. Item II contains the bulk of the geometrical information, beginning with (X, Y) pairs, in inches, for the leading edge and trailing edge [Item (3), Link (1)]. These are followed by the Y values, in inches, at which the airfoil upper and lower surface coordinates are specified [Item (5), Link (1)]. The Items (8) and (9), Link (1), contain the percent chord locations, followed by the corresponding upper surface coordinates, in

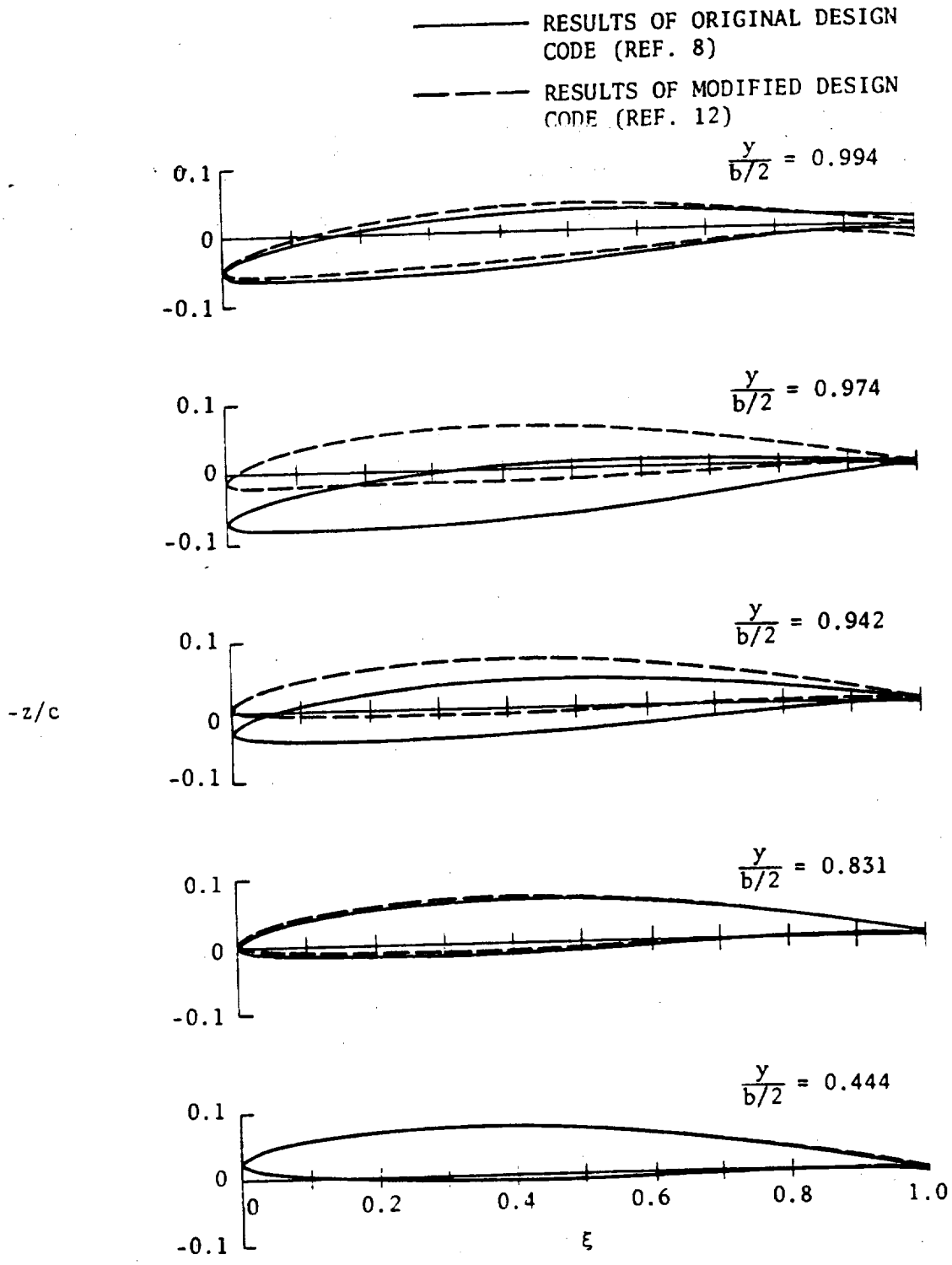

Figure 7. Comparison of wing-winglet model airfoil sections.

inches, and lower surface coordinates, in inches, at each airfoil station. A maximum of 21 airfoils may be specified, as has been done for the current wing model (Appendix B). A maximum of 30 coordinate triples may be specified for each airfoil. Straight line curve fitting in the spanwise direction an cubic curve fitting chordwise was used for the current models.

The detailed design work is currently being implemented under contract by LTV, and the final design will be constructed in-house by the model shop at NASA/LaRC.

CONCLUSIONS

The design process for construction of a wind-tunnel model of a subsonic transport wing fitted with winglets has been described. The camber shapes of the winglet models have been computed using two potential-flow wing-design programs. The two codes give quite different results on these winglets. As a result, these wind-tunnel models are to be used to determine which program gives a design shape with better performance. Also, the wind-tunnel test will provide information as to the utility of these potential flow programs in the design process. Also documented were the data preparation procedures necessary to obtain an input deck for numerically controlled machining of the models.

APPENDIX A

INPUT DATA AND OUTPUT FOR WING-WINGLET DESIGN USING CODES OF REFERENCES 8 AND 12

```
   1.          1.        20.9696    2353.6296
   6.          0.          0.          0.
 30.8332     -0.           6.          1.
-23.7143    -69.34        77.5         1.
-26.2111    -59.8777      77.5         1.
-33.5837    -71.4907       0.          1.
-35.3403    -71.4907      77.5         1.
-32.7033    -69.8777      77.5         1.
-31.8771    -69.34         6.          1.
-14.0067    -27.736        6.          1.
-9.1529     -0.
 100.  18.   20.   0.8   0.5
    1.0
  0.0
3.    35.
25.   10.
```


Input for Modified Design Code of Reference 12

GEOMETRY DATA

REFERENCE PLANFORM HAS 8 CURVES

ROOT CHORD HEIGHT = 0.00000 VARIABLE SWEEP PIVOT POSITION X(S) = 0.00000 Y(S) = 0.00000

BREAK POINTS FOR THE REFERENCE PLANFORM

POINT	X REF	Y REF	SWEEP ANGLE	DIHEDRAL ANGLE	MOVE CODE
1	30.83320	0.00000	38.19097	6.00000	1
2	-23.71430	-69.34000	83.32828	77.50000	1
3	-28.31110	-69.87770	72.99002	77.50000	1
4	-33.58370	-71.49070	90.00000	0.00000	1
5	-35.34030	-71.49070	58.52736	77.50000	1
6	-32.70530	-69.87770	58.52190	77.50000	1
7	-31.82710	-69.34000	23.18709	6.00000	1
8	-14.00670	-27.73600	9.92625	6.00000	1
9	-9.15290	0.00000			

Output for Modified Design Code of Reference 12

CONFIGURATION NO. 100.

CURVE 1 IS SWEPT 38.19097 DEGREES ON PLANFORM 1

BREAK POINTS FOR THIS CONFIGURATION

POINT	X	Y	Z	SWEEP ANGLE	DIHEDRAL ANGLE	MOVE CODE
1	38.83320	0.00000	0.00000	38.19097	6.00000	1
2	-23.71420	-69.34000	-7.28793	83.32828	77.50000	1
3	-29.31110	-69.87770	-9.71334	72.99002	77.50000	1
4	-33.96370	-71.49070	-16.98911	90.00000	0.00000	1
5	-35.24030	-71.49070	-16.98911	58.52736	77.50000	1
6	-22.70530	-69.87770	-9.71334	58.52190	77.50000	1
7	-31.82710	-69.34000	-7.28793	23.18709	6.00000	1
8	-34.00670	-27.73600	-2.91517	9.92625	6.00000	1
9	-9.15290	0.00000	0.00000			

-.71405+02

378 HORSESHOE VORTICES USED ON THE LEFT HALF OF THE CONFIGURATION

PLANFORM	TOTAL	SPANWISE
1	378	21

18. HORSESHOE VORTICES IN EACH CHORDWISE ROW

X SHIFT OF ORIGIN = 0.0000 UNITS

MINIMUM FIELD LENGTH = 63000

X C/4	X 3C/4	Y	Z	S	C/4 SWEEP ANGLE	DIHEDRAL ANGLE	GAMMA/U AT CLDES= .5000
-32.20892	-32.27729	-71.05967	-15.04485	1.99147	72.87795	77.50000	.04911
-32.34047	-32.41404	-71.05967	-15.04485	1.99147	72.41497	77.50000	.04911
-32.48241	-32.55079	-71.05967	-15.04485	1.99147	71.92712	77.50000	.04911
-32.61915	-32.68753	-71.05967	-15.04485	1.99147	71.41240	77.50000	.04911
-32.75591	-32.82428	-71.05967	-15.04485	1.99147	70.86864	77.50000	.04911
-32.89265	-32.96102	-71.05967	-15.04485	1.99147	70.29340	77.50000	.04911
-33.02940	-33.09777	-71.05967	-15.04485	1.99147	69.68400	77.50000	.04911
-33.16614	-33.23452	-71.05967	-15.04485	1.99147	69.03746	77.50000	.04911
-33.30289	-33.37126	-71.05967	-15.04485	1.99147	68.35044	77.50000	.04911
-33.43964	-33.50801	-71.05967	-15.04485	1.99147	67.61925	77.50000	.04911
-33.57638	-33.64476	-71.05967	-15.04485	1.99147	66.83975	77.50000	.04911
-33.71313	-33.78150	-71.05967	-15.04485	1.99147	66.00730	77.50000	.04911
-33.84987	-33.91825	-71.05967	-15.04485	1.99147	65.11671	77.50000	.04911
-33.98662	-34.05499	-71.05967	-15.04485	1.99147	64.16215	77.50000	.04911
-34.12337	-34.19174	-71.05967	-15.04485	1.99147	63.13706	77.50000	.04911
-34.26011	-34.32849	-71.05967	-15.04485	1.99147	62.03406	77.50000	.04911
-34.39686	-34.46523	-71.05967	-15.04485	1.99147	60.84483	77.50000	.04911
-34.53361	-34.60198	-71.05967	-15.04485	1.99147	59.56000	77.50000	.04911
-29.53694	-29.60531	-70.25817	-11.40696	1.73475	72.87795	77.50000	.08540
-29.67369	-29.74206	-70.25817	-11.40696	1.73475	72.41497	77.50000	.08540
-29.81043	-29.87881	-70.25817	-11.40696	1.73475	71.92712	77.50000	.08540
-29.94718	-30.01555	-70.25817	-11.40696	1.73475	71.41240	77.50000	.08540
-30.08392	-30.15230	-70.25817	-11.40696	1.73475	70.86864	77.50000	.08540
-30.22067	-30.28905	-70.25817	-11.40696	1.73475	70.29340	77.50000	.08540
-30.35741	-30.42579	-70.25817	-11.40696	1.73475	69.68400	77.50000	.08540
-30.49416	-30.56254	-70.25817	-11.40696	1.73475	69.03746	77.50000	.08540
-30.63091	-30.69929	-70.25817	-11.40696	1.73475	68.35044	77.50000	.08540
-30.76765	-30.83603	-70.25817	-11.40696	1.73475	67.61925	77.50000	.08540
-30.90440	-30.97278	-70.25817	-11.40696	1.73475	66.83975	77.50000	.08540
-31.04114	-31.10953	-70.25817	-11.40696	1.73475	66.00730	77.50000	.08540
-31.17789	-31.24627	-70.25817	-11.40696	1.73475	65.11671	77.50000	.08540
-31.31463	-31.38302	-70.25817	-11.40696	1.73475	64.16215	77.50000	.08540
-31.45138	-31.51977	-70.25817	-11.40696	1.73475	63.13706	77.50000	.08540
-31.58813	-31.65651	-70.25817	-11.40696	1.73475	62.03406	77.50000	.08540
-31.72487	-31.79326	-70.25817	-11.40696	1.73475	60.84483	77.50000	.08540
-31.86162	-31.93001	-70.25817	-11.40696	1.73475	59.56000	77.50000	.08540
-26.09995	-26.17226	-69.60985	-8.50063	1.24215	83.25316	77.50000	.10927
-26.24687	-26.32068	-69.60985	-8.50063	1.24215	82.93507	77.50000	.10927
-26.39439	-26.46910	-69.60985	-8.50063	1.24215	82.58568	77.50000	.10927
-26.54190	-26.61751	-69.60985	-8.50063	1.24215	82.20016	77.50000	.10927
-26.68922	-26.76593	-69.60985	-8.50063	1.24215	81.77264	77.50000	.10927
-26.83664	-26.91435	-69.60985	-8.50063	1.24215	81.29591	77.50000	.10927
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-29.53147	-26.70513	-69.60985	-8.50063	1.24215	80.15694	77.50000	.10927
-29.[illegible]	-[illegible]	-69.60985	-8.50063	1.24215	79.46902	77.50000	.10927
-29.32635	-29.46[illegible]	-69.60985	-8.50063	1.24215	78.67921	77.50000	.10927
-29.57372	-29.72733	-69.60985	-8.50063	1.24215	77.76326	77.50000	.10927
-29.82116	-30.04665	-69.60985	-8.50063	1.24215	76.68896	77.50000	.10927
-30.24959	-30.44826	-69.60985	-8.50063	1.24215	75.41234	77.50000	.10927
-30.66567	-30.78068	-69.60985	-8.50063	1.24215	73.87202	77.50000	.10927
-30.96229	-31.13715	-69.60985	-8.50063	1.24215	71.98001	77.50000	.10927
-31.31089	-31.48691	-69.60985	-8.50063	1.24215	69.60631	77.50000	.10927
-31.65422	-31.82393	-69.60985	-8.50063	1.24215	66.55250	77.50000	.10927
-32.00564	-32.17925	-69.60985	-8.50063	1.24215	62.50521	77.50000	.10927
-22.32080	-22.32586	-67.35944	-7.07976	1.99147	38.01439	6.00000	.13921
-22.76993	-23.01400	-67.35944	-7.07976	1.99147	37.29953	6.00000	.13921
-23.25007	-23.50414	-67.35944	-7.07976	1.99147	36.57081	6.00000	.13921
-23.74021	-23.99428	-67.35944	-7.07976	1.99147	35.82808	6.00000	.13921
-24.23935	-24.44442	-67.35944	-7.07976	1.99147	35.07118	6.00000	.13921
-24.72949	-24.97456	-67.35944	-7.07976	1.99147	34.29998	6.00000	.13921
-25.21963	-25.46470	-67.35944	-7.07976	1.99147	33.51435	6.00000	.13921
-25.70977	-25.95484	-67.35944	-7.07976	1.99147	32.71419	6.00000	.13921
-26.19991	-26.44498	-67.35944	-7.07976	1.99147	31.89942	6.00000	.13921
-26.69005	-26.93511	-67.35944	-7.07976	1.99147	31.06996	6.00000	.13921
-27.18018	-27.42525	-67.35944	-7.07976	1.99147	30.22577	6.00000	.13921
-27.67032	-27.91539	-67.35944	-7.07976	1.99147	29.36684	6.00000	.13921
-28.16046	-28.40553	-67.35944	-7.07976	1.99147	28.49317	6.00000	.13921
-28.65060	-28.89567	-67.35944	-7.07976	1.99147	27.60480	6.00000	.13921
-29.14074	-29.38581	-67.35944	-7.07976	1.99147	26.70178	6.00000	.13921
-29.63088	-29.87595	-67.35944	-7.07976	1.99147	25.78422	6.00000	.13921
-30.12102	-30.36609	-67.35944	-7.07976	1.99147	24.85224	6.00000	.13921
-30.61116	-30.85623	-67.35944	-7.07976	1.99147	23.90600	6.00000	.13921
-19.18243	-19.46653	-63.39833	-6.66343	1.99147	38.01439	6.00000	.16027
-19.79143	-20.03592	-63.39833	-6.66343	1.99147	37.29953	6.00000	.16027
-20.32542	-20.60482	-63.39833	-6.66343	1.99147	36.57081	6.00000	.16027
-20.88041	-21.17391	-63.39833	-6.66343	1.99147	35.82808	6.00000	.16027
-21.45241	-21.74291	-63.39833	-6.66343	1.99147	35.07118	6.00000	.16027
-22.02740	-22.31190	-63.39833	-6.66343	1.99147	34.29998	6.00000	.16027
-22.59640	-22.88089	-63.39833	-6.66343	1.99147	33.51435	6.00000	.16027
-23.16539	-23.44989	-63.39833	-6.66343	1.99147	32.71419	6.00000	.16027
-23.73439	-24.01888	-63.39833	-6.66343	1.99147	31.89942	6.00000	.16027
-24.30338	-24.58788	-63.39833	-6.66343	1.99147	31.06996	6.00000	.16027
-24.87237	-25.15687	-63.39833	-6.66343	1.99147	30.22577	6.00000	.16027
-25.44137	-25.72587	-63.39833	-6.66343	1.99147	29.36684	6.00000	.16027
-26.01036	-26.29486	-63.39833	-6.66343	1.99147	28.49317	6.00000	.16027
-26.57936	-26.86385	-63.39833	-6.66343	1.99147	27.60480	6.00000	.16027
-27.14835	-27.43285	-63.39833	-6.66343	1.99147	26.70178	6.00000	.16027
-27.71735	-28.00184	-63.39833	-6.66343	1.99147	25.78422	6.00000	.16027
-28.28634	-28.57084	-63.39833	-6.66343	1.99147	24.85224	6.00000	.16027
-28.85534	-29.13983	-63.39833	-6.66343	1.99147	23.90600	6.00000	.16027
-16.39607	-16.40489	-59.43721	-6.24710	1.99147	38.01439	6.00000	.17771
-16.73362	-17.[illegible]	-59.43721	-6.24710	1.99147	37.29953	6.00000	.17771

-17.38177	-17.73567	-59.43721	-6.24710	1.99147	36.57081	6.00000	.17771
-18.02562	-18.38158	-59.43721	-6.24710	1.99147	35.82808	6.00000	.17771
-18.67747	-19.03139	-59.43721	-6.24710	1.99147	35.07118	6.00000	.17771
-19.32932	-19.68924	-59.43721	-6.24710	1.99147	34.29998	6.00000	.17771
-19.97917	-20.34709	-59.43721	-6.24710	1.99147	33.51435	6.00000	.17771
-20.62702	-20.99494	-59.43721	-6.24710	1.99147	32.71419	6.00000	.17771
-21.26887	-21.63279	-59.43721	-6.24710	1.99147	31.89942	6.00000	.17771
-21.91672	-22.29064	-59.43721	-6.24710	1.99147	31.06996	6.00000	.17771
-22.56457	-22.96149	-59.43721	-6.24710	1.99147	30.22577	6.00000	.17771
-23.21242	-23.52634	-59.43721	-6.24710	1.99147	29.36684	6.00000	.17771
-23.85027	-24.18419	-59.43721	-6.24710	1.99147	28.49317	6.00000	.17771
-24.50111	-24.82204	-59.43721	-6.24710	1.99147	27.60480	6.00000	.17771
-25.15596	-25.47989	-59.43721	-6.24710	1.99147	26.70178	6.00000	.17771
-25.80381	-26.12774	-59.43721	-6.24710	1.99147	25.78422	6.00000	.17771
-26.45166	-26.77559	-59.43721	-6.24710	1.99147	24.85224	6.00000	.17771
-27.09951	-27.42344	-59.43721	-6.24710	1.99147	23.90600	6.00000	.17771
-12.98070	-13.33305	-55.47610	-5.83077	1.99147	38.01439	6.00000	.19289
-13.71641	-14.07976	-55.47610	-5.83077	1.99147	37.29953	6.00000	.19289
-14.44311	-14.80647	-55.47610	-5.83077	1.99147	36.57081	6.00000	.19289
-15.16982	-15.53317	-55.47610	-5.83077	1.99147	35.82808	6.00000	.19289
-15.89652	-16.25988	-55.47610	-5.83077	1.99147	35.07118	6.00000	.19289
-16.62323	-16.98658	-55.47610	-5.83077	1.99147	34.29998	6.00000	.19289
-17.34993	-17.71329	-55.47610	-5.83077	1.99147	33.51435	6.00000	.19289
-18.07664	-18.43999	-55.47610	-5.83077	1.99147	32.71419	6.00000	.19289
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-19.53005	-19.89340	-55.47610	-5.83077	1.99147	31.06996	6.00000	.19289
-20.25676	-20.62011	-55.47610	-5.83077	1.99147	30.22577	6.00000	.19289
-20.98346	-21.34681	-55.47610	-5.83077	1.99147	29.36684	6.00000	.19289
-21.71017	-22.07352	-55.47610	-5.83077	1.99147	28.49317	6.00000	.19289
-22.43687	-22.80022	-55.47610	-5.83077	1.99147	27.60480	6.00000	.19289
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-23.89028	-24.25364	-55.47610	-5.83077	1.99147	25.78422	6.00000	.19289
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-25.34369	-25.70705	-55.47610	-5.83077	1.99147	23.90600	6.00000	.19289
-9.89334	-10.28612	-51.51499	-5.41444	1.99147	38.01439	6.00000	.20620
-10.59490	-11.10168	-51.51499	-5.41444	1.99147	37.29953	6.00000	.20620
-11.50446	-11.90724	-51.51499	-5.41444	1.99147	36.57081	6.00000	.20620
-12.31002	-12.71280	-51.51499	-5.41444	1.99147	35.82808	6.00000	.20620
-13.11558	-13.51836	-51.51499	-5.41444	1.99147	35.07118	6.00000	.20620
-13.92114	-14.32392	-51.51499	-5.41444	1.99147	34.29998	6.00000	.20620
-14.72670	-15.12948	-51.51499	-5.41444	1.99147	33.51435	6.00000	.20620
-15.53226	-15.93504	-51.51499	-5.41444	1.99147	32.71419	6.00000	.20620
-16.33782	-16.74061	-51.51499	-5.41444	1.99147	31.89942	6.00000	.20620
-17.14339	-17.54617	-51.51499	-5.41444	1.99147	31.06996	6.00000	.20620
-17.94895	-18.35173	-51.51499	-5.41444	1.99147	30.22577	6.00000	.20620
-18.75451	-19.15729	-51.51499	-5.41444	1.99147	29.36684	6.00000	.20620
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-20.36563	-20.76841	-51.51499	-5.41444	1.99147	27.60480	6.00000	.20620
-21.17119	-21.57397	-51.51499	-5.41444	1.99147	26.70178	6.00000	.20620

-21.37575	-22.37953	-51.51429	-5.41444	1.99147	25.78422	6.00000	.20620
-22.78231	-23.13269	-51.51429	-5.41444	1.99147	24.85224	6.00000	.20620
-23.52737	-23.55058	-51.51429	-5.41444	1.99147	23.90600	6.00000	.20620
-5.79607	-7.23519	-47.55387	-4.99811	1.99147	38.01439	6.00000	.21802
-7.52135	-8.12369	-47.55387	-4.99811	1.99147	37.29953	6.00000	.21802
-8.50581	-8.60001	-47.55387	-4.99811	1.99147	36.57081	6.00000	.21802
-9.45022	-9.09243	-47.55387	-4.99811	1.99147	35.82808	6.00000	.21802
-10.23464	-10.77629	-47.55387	-4.99811	1.99147	35.07118	6.00000	.21802
-11.61105	-11.66126	-47.55387	-4.99811	1.99147	34.29998	6.00000	.21802
-12.16342	-12.55568	-47.55387	-4.99811	1.99147	33.51435	6.00000	.21802
-12.96789	-13.43000	-47.55387	-4.99811	1.99147	32.71419	6.00000	.21802
-13.72230	-14.31451	-47.55387	-4.99811	1.99147	31.89942	6.00000	.21802
-15.15677	-15.18993	-47.55387	-4.99811	1.99147	31.06996	6.00000	.21802
-15.94114	-16.06338	-47.55387	-4.99811	1.99147	30.22577	6.00000	.21802
-16.[illegible]	-16.96778	-47.55387	-4.99811	1.99147	29.36684	6.00000	.21802
-17.[illegible]	-17.[illegible]	-47.55387	-4.99811	1.99147	28.49317	6.00000	.21802
-18.[illegible]	-18.78559	-47.55387	-4.99811	1.99147	27.60469	6.00000	.21802
-19.17880	-19.66301	-47.55387	-4.99811	1.99147	26.70178	6.00000	.21802
-20.04332	-20.[illegible]	-47.55387	-4.99811	1.99147	25.78422	6.00000	.21802
-20.[illegible]	-21.[illegible]	-47.55387	-4.99811	1.99147	24.85224	6.00000	.21802
-21.83208	-22.[illegible]	-47.55387	-4.99811	1.99147	23.90600	6.00000	.21802
-3.73051	-4.[illegible]	-43.59276	-4.58178	1.99147	38.01439	6.00000	.22831
-4.[illegible]	-5.[illegible]	-43.59276	-4.58178	1.99147	37.29953	6.00000	.22831
-5.82715	-6.10078	-43.59276	-4.58178	1.99147	36.57081	6.00000	.22831
-5.58042	-7.07206	-43.59276	-4.58178	1.99147	35.82808	6.00000	.22831
-7.55379	-8.05532	-43.59276	-4.58178	1.99147	35.07113	6.00000	.22831
-8.31697	-8.96660	-43.59276	-4.58178	1.99147	34.29998	6.00000	.22831
-9.43024	-9.85169	-43.59276	-4.58178	1.99147	33.51435	6.00000	.22831
-10.46351	-10.82515	-43.59276	-4.58178	1.99147	32.71419	6.00000	.22831
-11.40675	-11.[illegible]42	-43.59276	-4.58173	1.99147	31.89942	6.00000	.22831
-12.37004	-12.65169	-43.59276	-4.58175	1.99147	31.06996	6.00000	.22831
-13.33323	-13.[illegible]	-43.59275	-4.58175	1.99147	30.22577	6.00000	.22831
-14.29660	-14.77824	-43.59276	-4.58178	1.99147	29.36684	6.00000	.22831
-15.25987	-15.74351	-43.59276	-4.58178	1.99147	28.49317	6.00000	.22831
-16.22314	-16.70479	-43.59276	-4.58178	1.99147	27.60480	6.00000	.22831
-17.18642	-17.[illegible]05	-43.59276	-4.58178	1.99147	26.70178	6.00000	.22831
-18.14969	-18.[illegible]12	-43.59276	-4.58178	1.99147	25.78422	6.00000	.22831
-19.[illegible]	-19.[illegible]0	-43.[illegible]	-4.[illegible]	1.99147	24.85224	6.00000	.22831
-20.07297	-20.[illegible]07	-43.59276	-4.58178	1.99147	23.90600	6.00000	.22831
-1.[illegible]	-1.12431	-39.63164	-4.16545	1.99147	38.01439	6.00000	.23738
-2.[illegible]	-2.[illegible]	-39.63164	-4.16545	1.99147	37.29953	6.00000	.23738
-2.69650	-3.[illegible]	-39.63164	-4.16545	1.99147	36.57081	6.00000	.23738
-3.72063	-4.22162	-39.63164	-4.16545	1.99147	35.82808	6.00000	.23738
-4.77275	-5.25382	-39.63164	-4.16545	1.99147	35.07118	6.00000	.23738
-5.81488	-6.33154	-39.63164	-4.16545	1.99147	34.29998	6.00000	.23738
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-7.[illegible]	-8.42620	-39.63164	-4.16545	1.99147	32.71419	6.00000	.23738
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-9.[illegible]	-10.[illegible]	-39.[illegible]	-4.16545	1.99147	31.06996	6.00000	.23738

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-12.06765	-12.5[illegible]71	-39.63164	-4.16545	1.99147	29.36684	6.00000	.23738
-13.10977	-13.63094	-39.63164	-4.16545	1.99147	28.49317	6.00000	.23738
-14.15190	-14.67296	-39.63164	-4.16545	1.99147	27.60480	6.00000	.23738
-15.19403	-15.71509	-39.63164	-4.16545	1.99147	26.70178	6.00000	.23738
-16.23616	-16.75722	-39.63164	-4.16545	1.99147	25.78422	6.00000	.23738
-17.27829	-17.79935	-39.63164	-4.16545	1.99147	24.85224	6.00000	.23738
-18.32041	-18.84147	-39.63164	-4.16545	1.99147	23.90600	6.00000	.23738
2.49212	1.93163	-35.67053	-3.74912	1.99147	38.01439	6.00000	.24535
1.37114	.81065	-35.67053	-3.74912	1.99147	37.29953	6.00000	.24535
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-.87083	-1.43132	-35.67053	-3.74912	1.99147	35.82808	6.00000	.24535
-1.99181	-2.55230	-35.67053	-3.74912	1.99147	35.07118	6.00000	.24535
-3.11279	-3.67329	-35.67053	-3.74912	1.99147	34.29998	6.00000	.24535
-4.23377	-4.79427	-35.67053	-3.74912	1.99147	33.51435	6.00000	.24535
-5.35476	-5.91525	-35.67053	-3.74912	1.99147	32.71419	6.00000	.24535
-6.47574	-7.03623	-35.67053	-3.74912	1.99147	31.89942	6.00000	.24535
-7.59673	-8.15722	-35.67053	-3.74912	1.99147	31.06996	6.00000	.24535
-8.71771	-9.27820	-35.67053	-3.74912	1.99147	30.22577	6.00000	.24535
-9.83869	-10.39918	-35.67053	-3.74912	1.99147	29.36684	6.00000	.24535
-10.95967	-11.52017	-35.67053	-3.74912	1.99147	28.49317	6.00000	.24535
-12.08066	-12.64115	-35.67053	-3.74912	1.99147	27.60480	6.00000	.24535
-13.20164	-13.76213	-35.67053	-3.74912	1.99147	26.70178	6.00000	.24535
-14.32262	-14.88312	-35.67053	-3.74912	1.99147	25.78422	6.00000	.24535
-15.44361	-16.00410	-35.67053	-3.74912	1.99147	24.85224	6.00000	.24535
-16.56459	-17.12508	-35.67053	-3.74912	1.99147	23.90600	6.00000	.24535
5.58340	4.98657	-31.70941	-3.33279	1.99147	38.01439	6.00000	.25231
4.33965	3.78673	-31.70941	-3.33279	1.99147	37.29953	6.00000	.25231
3.18981	2.68689	-31.70941	-3.33279	1.99147	36.57081	6.00000	.25231
1.93997	1.58705	-31.70941	-3.33279	1.99147	35.82808	6.00000	.25231
.79013	.48721	-31.70941	-3.33279	1.99147	35.07118	6.00000	.25231
-.41971	-1.01063	-31.70941	-3.33279	1.99147	34.29998	6.00000	.25231
-1.61055	-2.21046	-31.70941	-3.33279	1.99147	33.51435	6.00000	.25231
-2.81039	-3.41030	-31.70941	-3.33279	1.99147	32.71419	6.00000	.25231
-4.01022	-4.61014	-31.70941	-3.33279	1.99147	31.89942	6.00000	.25231
-5.21006	-5.80998	-31.70941	-3.33279	1.99147	31.06996	6.00000	.25231
-6.40990	-7.00982	-31.70941	-3.33279	1.99147	30.22577	6.00000	.25231
-7.60974	-8.20966	-31.70941	-3.33279	1.99147	29.36684	6.00000	.25231
-8.80959	-9.40950	-31.70941	-3.33279	1.99147	28.49317	6.00000	.25231
-10.00941	-10.60933	-31.70941	-3.33279	1.99147	27.60480	6.00000	.25231
-11.20925	-11.80917	-31.70941	-3.33279	1.99147	26.70178	6.00000	.25231
-12.40909	-13.00901	-31.70941	-3.33279	1.99147	25.78422	6.00000	.25231
-13.60893	-14.20885	-31.70941	-3.33279	1.99147	24.85224	6.00000	.25231
-14.80877	-15.40869	-31.70941	-3.33279	1.99147	23.90600	6.00000	.25231
7.91557	7.28602	-28.73243	-3.01990	1.00192	38.01439	6.00000	.25695
6.65447	6.07691	-28.73243	-3.01990	1.00192	37.29953	6.00000	.25695
5.39339	4.86781	-28.73243	-3.01990	1.00192	36.57081	6.00000	.25695
4.13229	3.65871	-28.73243	-3.01990	1.00192	35.82808	6.00000	.25695
2.87916	2.24961	-28.73243	-3.01990	1.00192	35.07118	6.00000	.25695

1.62005	.09050	-28.73243	-3.01990	1.00192	34.29998	6.00000	.25695
.36095	-.76960	-28.73243	-3.01990	1.00192	33.51435	6.00000	.25695
-.39815	-1.52770	-28.73243	-3.01990	1.00192	32.71419	6.00000	.25695
-2.15725	-2.27691	-28.73243	-3.01990	1.00192	31.89942	6.00000	.25695
-3.41636	-4.04591	-28.73243	-3.01990	1.00192	31.06996	6.00000	.25695
-4.67546	-5.80501	-28.73243	-3.01990	1.00192	30.22577	6.00000	.25695
-5.93456	-6.56411	-28.73243	-3.01990	1.00192	29.36684	6.00000	.25695
-7.19366	-7.82322	-28.73243	-3.01990	1.00192	28.49317	6.00000	.25695
-8.45277	-9.08232	-28.73243	-3.01990	1.00192	27.60480	6.00000	.25695
-9.71187	-10.34142	-28.73243	-3.01990	1.00192	26.70178	6.00000	.25695
-10.97097	-11.60052	-28.73243	-3.01990	1.00192	25.78422	6.00000	.25695
-12.23007	-12.85963	-28.73243	-3.01990	1.00192	24.85224	6.00000	.25695
-13.48918	-14.11873	-28.73243	-3.01990	1.00192	23.90600	6.00000	.25695
10.23868	9.51256	-25.75544	-2.70701	1.99147	37.88905	6.00000	.26109
8.98044	8.21632	-25.75544	-2.70701	1.99147	36.65626	6.00000	.26109
7.54220	6.87008	-25.75544	-2.70701	1.99147	35.38270	6.00000	.26109
6.10396	5.52383	-25.75544	-2.70701	1.99147	34.06763	6.00000	.26109
4.35071	4.17759	-25.75544	-2.70701	1.99147	32.71043	6.00000	.26109
3.50447	2.83135	-25.75544	-2.70701	1.99147	31.31065	6.00000	.26109
2.15623	1.48511	-25.75544	-2.70701	1.99147	29.86801	6.00000	.26109
.81199	.13887	-25.75544	-2.70701	1.99147	28.38241	6.00000	.26109
-.52425	-1.20737	-25.75544	-2.70701	1.99147	26.85399	6.00000	.26109
-1.88049	-2.55361	-25.75544	-2.70701	1.99147	25.28316	6.00000	.26109
-3.22873	-3.89985	-25.75544	-2.70701	1.99147	23.67056	6.00000	.26109
-4.57297	-5.24609	-25.75544	-2.70701	1.99147	22.01719	6.00000	.26109
-5.91922	-6.59234	-25.75544	-2.70701	1.99147	20.32431	6.00000	.26109
-7.26546	-7.93858	-25.75544	-2.70701	1.99147	18.59357	6.00000	.26109
-8.61170	-9.28482	-25.75544	-2.70701	1.99147	16.82693	6.00000	.26109
-9.95794	-10.63106	-25.75544	-2.70701	1.99147	15.02672	6.00000	.26109
-11.30418	-11.97730	-25.75544	-2.70701	1.99147	13.19564	6.00000	.26109
-12.65042	-13.32354	-25.75544	-2.70701	1.99147	11.33671	6.00000	.26109
13.31811	12.57769	-21.79433	-2.29068	1.99147	37.88905	6.00000	.26576
11.93726	11.09684	-21.79433	-2.29069	1.99147	36.65626	6.00000	.26576
10.35641	9.61599	-21.79433	-2.29068	1.99147	35.38270	6.00000	.26576
8.87557	8.13515	-21.79433	-2.29069	1.99147	34.06763	6.00000	.26576
7.39472	6.65430	-21.79433	-2.29068	1.99147	32.71043	6.00000	.26576
5.91388	5.17345	-21.79433	-2.29068	1.99147	31.31065	6.00000	.26576
4.43303	3.69261	-21.79433	-2.29068	1.99147	29.86801	6.00000	.26576
2.95219	2.21176	-21.79433	-2.29068	1.99147	28.38241	6.00000	.26576
1.47134	.73092	-21.79433	-2.29068	1.99147	26.85399	6.00000	.26576
-.00951	-.74993	-21.79433	-2.29068	1.99147	25.28316	6.00000	.26576
-1.49035	-2.23078	-21.79433	-2.29068	1.99147	23.67056	6.00000	.26576
-2.97120	-3.71162	-21.79433	-2.29068	1.99147	22.01719	6.00000	.26576
-4.45204	-5.19247	-21.79433	-2.29068	1.99147	20.32431	6.00000	.26576
-5.93289	-6.67331	-21.79433	-2.29068	1.99147	18.59357	6.00000	.26576
-7.41374	-8.15416	-21.79433	-2.29068	1.99147	16.82693	6.00000	.26576
-8.89458	-9.63500	-21.79433	-2.29068	1.99147	15.02672	6.00000	.26576
-10.37543	-11.11585	-21.79433	-2.29068	1.99147	13.19564	6.00000	.26576
-11.85627	-12.59670	-21.79433	-2.29068	1.99147	11.33671	6.00000	.26576

16.40653	15.59261	-17.53321	-1.87435	1.99147	37.88905	6.00000	.26961
14.73902	13.97736	-17.83321	-1.87435	1.99147	36.65626	6.00000	.26961
13.16963	12.36151	-17.83321	-1.87435	1.99147	35.38270	6.00000	.26961
11.55419	10.74646	-17.83321	-1.87435	1.99147	34.06763	6.00000	.26961
9.93772	9.13107	-17.83321	-1.87435	1.99147	32.71043	6.00000	.26961
8.32228	7.51556	-17.83321	-1.87435	1.99147	31.31065	6.00000	.26961
6.70782	5.90011	-17.83321	-1.87435	1.99147	29.86801	6.00000	.26961
5.09225	4.28465	-17.83321	-1.87435	1.99147	28.38241	6.00000	.26961
3.47783	2.66920	-17.83321	-1.87435	1.99147	26.85399	6.00000	.26961
1.86245	1.05375	-17.83321	-1.87435	1.99147	25.28316	6.00000	.26961
.24803	-.56170	-17.83321	-1.87435	1.99147	23.67056	6.00000	.26961
-1.36642	-2.17715	-17.83321	-1.87435	1.99147	22.01719	6.00000	.26961
-2.98087	-3.79260	-17.83321	-1.87435	1.99147	20.32431	6.00000	.26961
-4.59532	-5.40805	-17.83321	-1.87435	1.99147	18.59357	6.00000	.26961
-6.21077	-7.02350	-17.83321	-1.87435	1.99147	16.82693	6.00000	.26961
-7.83122	-8.63895	-17.83321	-1.87435	1.99147	15.02672	6.00000	.26961
-9.44667	-10.25440	-17.83321	-1.87435	1.99147	13.19564	6.00000	.26961
-11.06212	-11.86985	-17.83321	-1.87435	1.99147	11.33671	6.00000	.26961
18.40236	18.60793	-13.87210	-1.45802	1.99147	37.88905	6.00000	.27266
17.73291	16.99274	-13.87210	-1.45802	1.99147	36.65626	6.00000	.27266
15.73265	15.38765	-13.87210	-1.45802	1.99147	35.38270	6.00000	.27266
14.23289	13.78262	-13.87210	-1.45802	1.99147	34.06763	6.00000	.27266
12.66274	12.17777	-13.87210	-1.45802	1.99147	32.71043	6.00000	.27266
10.73269	10.57271	-13.87210	-1.45802	1.99147	31.31065	6.00000	.27266
9.39253	8.96760	-13.87210	-1.45802	1.99147	29.86801	6.00000	.27266
7.83254	7.36255	-13.87210	-1.45802	1.99147	28.38241	6.00000	.27266
5.40232	5.75749	-13.87210	-1.45802	1.99147	26.85399	6.00000	.27266
3.73244	2.95744	-13.87210	-1.45802	1.99147	25.28316	6.00000	.27266
1.36241	1.16231	-13.87210	-1.45802	1.99147	23.67056	6.00000	.27266
.23235	-.44267	-13.87210	-1.45802	1.99147	22.01719	6.00000	.27266
-1.21770	-2.05773	-13.87210	-1.45802	1.99147	20.32431	6.00000	.27266
-3.26774	-4.14278	-13.87210	-1.45802	1.99147	18.59357	6.00000	.27266
-5.21321	-5.99284	-13.87210	-1.45802	1.99147	16.82693	6.00000	.27266
-6.79787	-7.64289	-13.87210	-1.45802	1.99147	15.02672	6.00000	.27266
-8.51782	-9.30295	-13.87210	-1.45802	1.99147	13.19564	6.00000	.27266
-10.26755	-11.14300	-13.87210	-1.45802	1.99147	11.33671	6.00000	.27266
22.54539	21.60305	-9.91099	-1.04169	1.99147	37.88905	6.00000	.27495
20.68073	19.73040	-9.91099	-1.04169	1.99147	36.65626	6.00000	.27495
18.79687	17.84574	-9.91099	-1.04169	1.99147	35.38270	6.00000	.27495
16.91141	15.96108	-9.91099	-1.04169	1.99147	34.06763	6.00000	.27495
15.02675	14.07642	-9.91099	-1.04169	1.99147	32.71043	6.00000	.27495
13.14209	12.19176	-9.91099	-1.04169	1.99147	31.31065	6.00000	.27495
11.25743	10.31510	-9.91099	-1.04169	1.99147	29.86801	6.00000	.27495
9.37277	8.42844	-9.91099	-1.04169	1.99147	28.38241	6.00000	.27495
7.48811	6.54378	-9.91099	-1.04169	1.99147	26.85399	6.00000	.27495
5.60345	4.65912	-9.91099	-1.04169	1.99147	25.28316	6.00000	.27495
3.71879	2.77446	-9.91099	-1.04169	1.99147	23.67056	6.00000	.27495
1.83413	.89130	-9.91099	-1.04169	1.99147	22.01719	6.00000	.27495
-.05063	-.99726	-9.91099	-1.04169	1.99147	20.32431	6.00000	.27495

-1.93519	-2.87752	-2.91099	-1.04169	1.99147	18.59357	6.00000	.27495
-3.21985	-4.76213	-2.91099	-1.04169	1.99147	16.82693	6.00000	.27495
-5.70451	-5.64684	-2.91099	-1.04169	1.99147	15.02672	6.00000	.27495
-7.58917	-4.53155	-2.91099	-1.04169	1.99147	13.19564	6.00000	.27495
-9.47383	-10.41626	-2.91099	-1.04169	1.99147	11.33671	6.00000	.27495
25.64732	24.63939	-5.94987	-.62536	1.99147	37.86905	6.00000	.27649
23.62856	23.61992	-5.94987	-.62536	1.99147	36.65626	6.00000	.27649
21.60980	20.59986	-5.94987	-.62536	1.99147	35.38270	6.00000	.27649
19.59002	18.58039	-5.94987	-.62536	1.99147	34.06763	6.00000	.27649
17.57076	16.56113	-5.94987	-.62536	1.99147	32.71043	6.00000	.27649
15.55149	14.54186	-5.94987	-.62536	1.99147	31.31065	6.00000	.27649
13.53223	12.52260	-5.94987	-.62536	1.99147	29.86801	6.00000	.27649
11.51296	10.50333	-5.94987	-.62536	1.99147	28.38241	6.00000	.27649
9.49370	8.48407	-5.94987	-.62536	1.99147	26.85399	6.00000	.27649
7.47444	6.46480	-5.94987	-.62536	1.99147	25.28316	6.00000	.27649
5.45517	4.44554	-5.94987	-.62536	1.99147	23.67056	6.00000	.27649
3.43591	2.42627	-5.94987	-.62536	1.99147	22.01719	6.00000	.27649
1.41664	.40701	-5.94987	-.62536	1.99147	20.32431	6.00000	.27649
-.60262	-1.61225	-5.94987	-.62536	1.99147	18.59357	6.00000	.27649
-2.62189	-3.63152	-5.94987	-.62536	1.99147	16.82693	6.00000	.27649
-4.64115	-5.65078	-5.94987	-.62536	1.99147	15.02672	6.00000	.27649
-6.66041	-7.67005	-5.94987	-.62536	1.99147	13.19564	6.00000	.27649
-8.67969	-9.68931	-5.94987	-.62536	1.99147	11.33671	6.00000	.27649
28.73343	27.69643	-1.98466	-.20860	1.99559	37.86905	6.00000	.27726
26.67942	25.50242	-1.98466	-.20860	1.99559	36.65626	6.00000	.27726
24.62542	23.54841	-1.98466	-.20860	1.99559	35.38270	6.00000	.27726
22.57141	21.59440	-1.98466	-.20860	1.99559	34.06763	6.00000	.27726
20.51740	19.64040	-1.98466	-.20860	1.99559	32.71043	6.00000	.27726
18.46339	17.68639	-1.98466	-.20860	1.99559	31.31065	6.00000	.27726
16.40938	15.73238	-1.98466	-.20860	1.99559	29.86801	6.00000	.27726
14.35537	13.77837	-1.98466	-.20860	1.99559	28.38241	6.00000	.27726
12.30137	11.82436	-1.98466	-.20860	1.99559	26.85399	6.00000	.27726
10.24736	9.87035	-1.98466	-.20860	1.99559	25.28316	6.00000	.27726
8.19335	7.91635	-1.98466	-.20860	1.99559	23.67056	6.00000	.27726
6.13934	5.96234	-1.98466	-.20860	1.99559	22.01719	6.00000	.27726
4.08533	4.00833	-1.98466	-.20860	1.99559	20.32431	6.00000	.27726
2.03132	2.05432	-1.98466	-.20860	1.99559	18.59357	6.00000	.27726
-.02269	.10031	-1.98466	-.20860	1.99559	16.82693	6.00000	.27726
-2.07670	-1.84370	-1.98466	-.20860	1.99559	15.02672	6.00000	.27726
-4.13071	-3.80770	-1.98466	-.20860	1.99559	13.19564	6.00000	.27726
-6.18471	-5.77171	-1.98466	-.20860	1.99559	11.33671	6.00000	.27726

REF. CHORD	C AVERAGE	TRUE AREA	REFERENCE AREA	B/2	REF. AR	TRUE AR	MACH NUMBER
20.96960	21.39795	3059.49486	2353.62960	71.49070	8.68602	6.68204	.80000

A = 1.00000

FIRST PLANFORM SPAN LOADING

Y	CL*C
-71.05967	.38265
-70.25317	.66546
-69.60685	.85137
-67.35944	4.98427
-63.39833	5.73809
-59.43721	6.36234
-55.47610	6.90617
-51.51499	7.38248
-47.55387	7.80560
-43.59276	8.17397
-39.63164	8.49878
-35.67053	8.78426
-31.70941	9.03333
-27.74830	9.25949
-25.76544	9.34767
-21.79433	9.51510
-17.82321	9.65265
-13.85210	9.76213
-9.91099	9.84404
-5.94987	9.89900
-1.98876	9.92670

CL DEVELOPED ON THIS PLANFORM= .500091
CM DEVELOPED ON THIS PLANFORM= -.128556

CL DESIGN = .500000 CL COMPUTED= .500091 CM COMPUTED= -.128556 CD V= .008141

LOCAL ELEVATION DATA

Y= -71.0597 Y/B/2= -.9940 CHORD= 2.4614

SLOPES, DZ/DX, AT SLOPE POINTS, FROM FRONT TO REAR

.9841 .7234 .6096 .5245 .4650 .3950 .3411 .2910 .2432 .1964 .1492 .1003 .0480-.0101-.0703-.1661-.3010-.6781

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
-.0000	.2304	-.0000	.5671
.0250	-.2077	.0615	.5111
.0500	-.1850	.1231	.4555
.0750	-.1639	.1846	.4031
.1000	-.1448	.2461	.3565
.1250	-.1278	.3077	.3145
.1500	-.1119	.3692	.2755
.1750	-.0971	.4308	.2389
.2000	-.0832	.4923	.2047
.2250	-.0702	.5538	.1728
.2500	-.0581	.6154	.1429
.2750	-.0469	.6769	.1148
.3000	-.0365	.7384	.0884
.3250	-.0269	.8000	.0637
.3500	-.0180	.8615	.0405
.3750	-.0096	.9230	.0188
.4000	-.0019	.9846	-.0015
.4250	-.0051	1.0461	-.0204
.4500	-.0116	1.1076	-.0379
.4750	-.0220	1.1692	-.0542
.5000	-.0281	1.2307	-.0690
.5250	-.0336	1.2923	-.0826
.5500	-.0386	1.3538	-.0949
.5750	-.0430	1.4153	-.1059
.6000	-.0470	1.4769	-.1156
.6250	-.0504	1.5384	-.1240
.6500	-.0532	1.5999	-.1310

.6750	-.0555	1.6615	-.1266
.7000	-.0572	1.7220	-.1409
.7250	-.0583	1.7845	-.1425
.7500	-.0588	1.8461	-.1446
.7750	-.0585	1.9076	-.1441
.8000	-.0576	1.9691	-.1419
.8250	-.0559	2.0307	-.1377
.8500	-.0532	2.0922	-.1310
.8750	-.0495	2.1538	-.1219
.9000	-.0450	2.2153	-.1108
.9250	-.0394	2.2769	-.0971
.9500	-.0306	2.3384	-.0753
.9750	-.0167	2.3999	-.0412
1.0000	0.0000	2.4614	0.0000

Y= -70.2532 Y/B/2= -.9827 CHORD= 3.7802

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0752 .2481 .4364 .5372 .4552 .3835 .3184 .2572 .1983 .1402 .0817 .0212-.0430-.1137-.1957-.2996-.4566-.8874

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
-.0000	.1804	-.0000	.6821
.0250	.1559	.0945	.5893
.0500	.1315	.1890	.4971
.0750	.1087	.2835	.4107
.1000	.0874	.3780	.3343
.1250	.0704	.4725	.2662
.1500	.0568	.5670	.2035
.1750	.0383	.6615	.1450
.2000	.0240	.7560	.0907
.2250	.0107	.8506	.0406
.2500	-.0016	.9451	-.0059
.2750	-.0130	1.0396	-.0491
.3000	-.0239	1.1341	-.0892
.3250	-.0334	1.2286	-.1263
.3500	-.0424	1.3231	-.1604
.3750	-.0508	1.4176	-.1919
.4000	-.0584	1.5121	-.2206
.4250	-.0653	1.6066	-.2468
.4500	-.0715	1.7011	-.2704
.4750	-.0771	1.7956	-.2915
.5000	-.0820	1.8901	-.3101
.5250	-.0863	1.9846	-.3262
.5500	-.0899	2.0791	-.3399
.5750	-.0929	2.1736	-.3511
.6000	-.0952	2.2681	-.3598
.6250	-.0968	2.3626	-.3660
.6500	-.0979	2.4571	-.3695
.6750	-.0980	2.5517	-.3705
.7000	-.0976	2.6462	-.3688
.7250	-.0966	2.7407	-.3642

.7500	-.0944	2.8352	-.3567
.7750	-.0916	2.9297	-.3461
.8000	-.0879	3.0242	-.3324
.8250	-.0833	3.1187	-.3151
.8500	-.0775	3.2132	-.2931
.8750	-.0705	3.3077	-.2667
.9000	-.0627	3.4022	-.2370
.9250	-.0535	3.4967	-.2023
.9500	-.0406	3.5912	-.1534
.9750	-.0219	3.6857	-.0829
1.0000	0.0000	3.7802	0.0000

Y= -59.6089 Y/P/2= -.9737 CHORD= 6.2535

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.9964 .4672 .4579 .3279 .2226 .1408 .0764 .0250-.0172-.0533-.0859-.1175-.1504-.1879-.2349-.3008-.4092-.7255

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
-.0000	.0598	-.0000	.3738
.0250	.0346	.1563	-.2162
.0500	.0096	.3127	.0599
.0750	-.0129	.4690	-.0807
.1000	-.0312	.6254	-.1950
.1250	-.0460	.7817	-.2877
.1500	-.0587	.9380	-.3672
.1750	-.0696	1.0944	-.4364
.2000	-.0792	1.2507	-.4955
.2250	-.0872	1.4070	-.5454
.2500	-.0939	1.5634	-.5874
.2750	-.0996	1.7197	-.6226
.3000	-.1042	1.8761	-.6517
.3250	-.1080	2.0324	-.6751
.3500	-.1109	2.1887	-.6936
.3750	-.1132	2.3451	-.7077
.4000	-.1148	2.5014	-.7177
.4250	-.1158	2.6577	-.7240
.4500	-.1163	2.8141	-.7270
.4750	-.1163	2.9704	-.7270
.5000	-.1158	3.1268	-.7242
.5250	-.1149	3.2831	-.7187
.5500	-.1137	3.4394	-.7108
.5750	-.1120	3.5958	-.7005
.6000	-.1100	3.7521	-.6880
.6250	-.1076	3.9084	-.6732
.6500	-.1049	4.0648	-.6562
.6750	-.1019	4.2211	-.6369
.7000	-.0984	4.3775	-.6154
.7250	-.0946	4.5338	-.5915

.7500	-.0903	4.6901	-.5649
.7750	-.0857	4.8445	-.5357
.8000	-.0805	5.0028	-.5037
.8250	-.0748	5.1591	-.4681
.8500	-.0684	5.3155	-.4278
.8750	-.0612	5.4719	-.3826
.9000	-.0534	5.6282	-.3342
.9250	-.0448	5.7845	-.2803
.9500	-.0335	5.9408	-.2094
.9750	-.0179	6.0972	-.1122
1.0000	0.0000	6.2535	0.0000

Y= -67.3594 Y/B/2= -.9422 CHORD= 0.8225

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1240 .0824 .0707 .0536 .0389 .0257 .0136 .0024-.0081-.0180-.0275-.0367-.0460-.0559-.0671-.0816-.1042-.1707

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0035	0.0000	-.0577
.0250	-.0047	.2206	-.0857
.0500	-.0127	.4411	-.1135
.0750	-.0158	.6617	-.1391
.1000	-.0182	.8822	-.1609
.1250	-.0206	1.1028	-.1796
.1500	-.0222	1.3234	-.1962
.1750	-.0239	1.5439	-.2111
.2000	-.0254	1.7645	-.2243
.2250	-.0267	1.9851	-.2359
.2500	-.0279	2.2056	-.2460
.2750	-.0289	2.4262	-.2546
.3000	-.0297	2.6467	-.2620
.3250	-.0304	2.8673	-.2680
.3500	-.0309	3.0879	-.2728
.3750	-.0313	3.3084	-.2764
.4000	-.0316	3.5290	-.2788
.4250	-.0317	3.7496	-.2801
.4500	-.0317	3.9701	-.2803
.4750	-.0317	4.1907	-.2795
.5000	-.0315	4.4112	-.2776
.5250	-.0311	4.6318	-.2748
.5500	-.0307	4.8524	-.2710
.5750	-.0302	5.0729	-.2662
.6000	-.0295	5.2935	-.2605
.6250	-.0288	5.5141	-.2539
.6500	-.0279	5.7346	-.2464
.6750	-.0270	5.9552	-.2379
.7000	-.0259	6.1757	-.2285
.7250	-.0247	6.3963	-.2182

.7500	-.0235	6.6169	-.2069
.7750	-.0221	6.8374	-.1946
.8000	-.0206	7.0580	-.1814
.8250	-.0190	7.2786	-.1669
.8500	-.0171	7.4991	-.1510
.8750	-.0151	7.7197	-.1336
.9000	-.0131	7.9402	-.1152
.9250	-.0108	8.1608	-.0952
.9500	-.0079	8.3814	-.0701
.9750	-.0042	8.6019	-.0373
1.0000	0.0000	8.8225	0.0000

Y= -63.3983 Y/B/2= -.8868 CHORD= 10.2419

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1221 .0895 .0639 .0533 .0404 .0290 .0187 .0089-.0005-.0098-.0191-.0288-.0390-.0502-.0632-.0797-.1046-.1730

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0035	0.0000	-.0355
.0250	-.0065	.2560	-.0670
.0500	-.0096	.5121	-.0983
.0750	-.0124	.7681	-.1271
.1000	-.0148	1.0242	-.1516
.1250	-.0169	1.2802	-.1726
.1500	-.0187	1.5363	-.1914
.1750	-.0203	1.7923	-.2078
.2000	-.0218	2.0484	-.2234
.2250	-.0231	2.3044	-.2368
.2500	-.0243	2.5605	-.2486
.2750	-.0253	2.8165	-.2591
.3000	-.0262	3.0726	-.2681
.3250	-.0269	3.3286	-.2759
.3500	-.0276	3.5847	-.2825
.3750	-.0281	3.8407	-.2878
.4000	-.0285	4.0968	-.2920
.4250	-.0288	4.3528	-.2951
.4500	-.0290	4.6089	-.2971
.4750	-.0291	4.8649	-.2980
.5000	-.0291	5.1209	-.2978
.5250	-.0290	5.3770	-.2966
.5500	-.0287	5.6330	-.2943
.5750	-.0284	5.8891	-.2909
.6000	-.0280	6.1451	-.2864
.6250	-.0274	6.4012	-.2808
.6500	-.0268	6.6572	-.2741
.6750	-.0260	6.9133	-.2663
.7000	-.0251	7.1693	-.2574
.7250	-.0241	7.4254	-.2472

.7500	-.0276	7.6614	-.2357
.7750	-.0219	7.8375	-.2229
.8000	-.0164	8.1935	-.2088
.8250	-.0113	8.4496	-.1931
.8500	-.0071	8.7056	-.1754
.8750	-.0038	8.9617	-.1556
.9000	-.0132	9.2177	-.1346
.9250	-.0102	9.4738	-.1117
.9500	-.0081	9.7298	-.0824
.9750	-.0044	9.9859	-.0459
1.0000	0.0000	10.2419	0.0000

Y= -99.4972 Y/B/2= -.8314 CHORD= 11.6613

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1193 .0840 .0640 .0489 .0364 .0253 .0157 .0064-.0026-.0112-.0199-.0290-.0386-.0493-.0617-.0776-.1018-.1685

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0051	0.0000	-.0591
.0250	-.0080	.2815	-.0932
.0500	-.0109	.5631	-.1270
.0750	-.0135	.8446	-.1580
.1000	-.0158	1.1261	-.1842
.1250	-.0177	1.4077	-.2066
.1500	-.0194	1.6892	-.2265
.1750	-.0210	2.0407	-.2444
.2000	-.0223	2.3223	-.2603
.2250	-.0235	2.6038	-.2743
.2500	-.0246	2.9153	-.2865
.2750	-.0255	3.2069	-.2972
.3000	-.0263	3.4884	-.3065
.3250	-.0270	3.7699	-.3143
.3500	-.0275	4.0815	-.3208
.3750	-.0280	4.3730	-.3260
.4000	-.0283	4.6645	-.3299
.4250	-.0285	4.9561	-.3326
.4500	-.0287	5.2476	-.3342
.4750	-.0287	5.5391	-.3346
.5000	-.0286	5.8306	-.3338
.5250	-.0285	6.1222	-.3319
.5500	-.0282	6.4137	-.3288
.5750	-.0278	6.7052	-.3246
.6000	-.0274	6.9968	-.3192
.6250	-.0268	7.2883	-.3127
.6500	-.0262	7.5799	-.3050
.6750	-.0254	7.8714	-.2961
.7000	-.0245	8.1629	-.2859
.7250	-.0235	8.4544	-.2744

.7500	-.0224	8.7460	-.2615
.7750	-.0212	9.0375	-.2473
.8000	-.0199	9.3290	-.2315
.8250	-.0184	9.6206	-.2141
.8500	-.0167	9.9121	-.1945
.8750	-.0146	10.2036	-.1727
.9000	-.0123	10.4952	-.1494
.9250	-.0100	10.7867	-.1238
.9500	-.0072	11.0782	-.0914
.9750	-.0042	11.3698	-.0486
1.0000	0.0000	11.6613	0.0000

Y= -55.4761 Y/B/2= -.7760 CHORD= 13.0307

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1031 .0764 .0590 .0442 .0322 .0217 .0122 .0033-.0052-.0136-.0219-.0306-.0398-.0499-.0618-.0771-.1003-.1648

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1527 .2083 .2639 .3194 .3750 .4305 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0075	0.0000	-.0985
.0256	-.0103	.3270	-.1345
.0500	-.0130	.6540	-.1702
.0750	-.0155	.9811	-.2029
.1000	-.0176	1.3081	-.2305
.1250	-.0194	1.6351	-.2528
.1500	-.0210	1.9621	-.2744
.1750	-.0224	2.2891	-.2929
.2000	-.0236	2.6161	-.3091
.2250	-.0247	2.9432	-.3233
.2500	-.0257	3.2702	-.3356
.2750	-.0266	3.5972	-.3463
.3000	-.0272	3.9242	-.3553
.3250	-.0277	4.2512	-.3626
.3500	-.0280	4.5782	-.3689
.3750	-.0283	4.9053	-.3735
.4000	-.0284	5.2323	-.3768
.4250	-.0285	5.5593	-.3788
.4500	-.0286	5.8863	-.3796
.4750	-.0286	6.2133	-.3790
.5000	-.0285	6.5403	-.3773
.5250	-.0284	6.8674	-.3743
.5500	-.0283	7.1944	-.3700
.5750	-.0279	7.5214	-.3646
.6000	-.0274	7.8484	-.3579
.6250	-.0268	8.1754	-.3499
.6500	-.0260	8.5025	-.3407
.6750	-.0252	8.8295	-.3302
.7000	-.0243	9.1565	-.3184
.7250	-.0233	9.4835	-.3051

.7500	-.0222	9.8105	-.2904
.7750	-.0210	10.1375	-.2741
.8000	-.0196	10.4646	-.2563
.8250	-.0181	10.7916	-.2367
.8500	-.0164	11.1186	-.2147
.8750	-.0146	11.4455	-.1905
.9000	-.0126	11.7726	-.1646
.9250	-.0104	12.0996	-.1361
.9500	-.0077	12.4267	-.1004
.9750	-.0041	12.7537	-.0534
1.0000	0.0000	13.0807	0.0000

Y= -31.5150 Y/B/2= -.7206 CHORD= 14.5001

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1003 .0723 .0441 .0160 .0281 .0181 .0080 .0004-.0078-.0158-.0238-.0320-.0408-.0505-.0619-.0765-.0988-.1609

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0000	0.0000	-.1428
.0250	-.0124	.3625	-.1803
.0500	-.0150	.7250	-.2175
.0750	-.0173	1.0875	-.2514
.1000	-.0193	1.4500	-.2799
.1250	-.0210	1.8125	-.3038
.1500	-.0224	2.1750	-.3248
.1750	-.0237	2.5375	-.3435
.2000	-.0249	2.9000	-.3599
.2250	-.0259	3.2625	-.3740
.2500	-.0266	3.6250	-.3862
.2750	-.0273	3.9875	-.3965
.3000	-.0279	4.3500	-.4052
.3250	-.0284	4.7125	-.4122
.3500	-.0288	5.0750	-.4176
.3750	-.0291	5.4375	-.4216
.4000	-.0292	5.8000	-.4241
.4250	-.0293	6.1625	-.4253
.4500	-.0293	6.5250	-.4250
.4750	-.0292	6.8875	-.4235
.5000	-.0290	7.2500	-.4206
.5250	-.0287	7.6126	-.4164
.5500	-.0283	7.9751	-.4109
.5750	-.0279	8.3376	-.4041
.6000	-.0273	8.7001	-.3960
.6250	-.0267	9.0626	-.3865
.6500	-.0259	9.4251	-.3758
.6750	-.0251	9.7876	-.3636
.7000	-.0241	10.1501	-.3500
.7250	-.0231	10.5125	-.3350

.7500	-.0220	10.8751	-.3183
.7750	-.0207	11.2376	-.3001
.8000	-.0193	11.6001	-.2802
.8250	-.0178	11.9626	-.2584
.8500	-.0161	12.3251	-.2341
.8750	-.0143	12.6876	-.2073
.9000	-.0123	13.0501	-.1779
.9250	-.0102	13.4126	-.1477
.9500	-.0075	13.7751	-.1087
.9750	-.0040	14.1376	-.0578
1.0000	0.0000	14.5001	0.0000

Y= -47.5539 Y/B/2= -.6652 CHORD= 15.9195

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0593 .0474 .0493 .0396 .0243 .0143 .0057-.0025-.0104-.0181-.0298-.0387-.0421-.0514-.0623-.0763-.0977-.1574

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0123	0.0000	-.1953
.0250	-.0147	.3830	-.2338
.0500	-.0171	.7960	-.2720
.0750	-.0193	1.1940	-.3069
.1000	-.0211	1.5919	-.3359
.1250	-.0226	1.9899	-.3601
.1500	-.0239	2.3879	-.3812
.1750	-.0251	2.7859	-.3998
.2000	-.0261	3.1839	-.4160
.2250	-.0270	3.5819	-.4298
.2500	-.0277	3.9799	-.4415
.2750	-.0283	4.3779	-.4513
.3000	-.0288	4.7759	-.4592
.3250	-.0292	5.1738	-.4655
.3500	-.0295	5.5718	-.4701
.3750	-.0297	5.9698	-.4732
.4000	-.0298	6.3678	-.4747
.4250	-.0298	6.7658	-.4747
.4500	-.0297	7.1638	-.4733
.4750	-.0296	7.5618	-.4705
.5000	-.0293	7.9597	-.4663
.5250	-.0289	8.3577	-.4607
.5500	-.0285	8.7557	-.4538
.5750	-.0280	9.1537	-.4454
.6000	-.0274	9.5517	-.4357
.6250	-.0267	9.9497	-.4246
.6500	-.0259	10.3477	-.4121
.6750	-.0250	10.7457	-.3981
.7000	-.0240	11.1436	-.3826
.7250	-.0230	11.5416	-.3656

.7500	-.0212	11.9396	-.3469
.7750	-.0205	12.3376	-.3266
.8000	-.0191	12.7356	-.3045
.8250	-.0174	13.1336	-.2803
.8500	-.0159	13.5316	-.2536
.8750	-.0141	13.9296	-.2243
.9000	-.0121	14.3275	-.1931
.9250	-.0100	14.7255	-.1592
.9500	-.0077	15.1235	-.1169
.9750	-.0033	15.5215	-.0680
1.0000	0.0000	15.9195	0.0000

Y= -43.5028 Y/B/2= -.6098 CHORD= 17.3369

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0595 .0620 .0446 .0315 .0256 .0117 .0027-.0051-.0126-.0200-.0273-.0349-.0429-.0518-.0622-.0756-.0961-.1534

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0143	0.0000	-.2488
.0250	-.0166	.4335	-.2680
.0500	-.0189	.8669	-.3269
.0750	-.0209	1.3004	-.3622
.1000	-.0226	1.7338	-.3914
.1250	-.0240	2.1674	-.4155
.1500	-.0252	2.6008	-.4365
.1750	-.0262	3.0343	-.4548
.2000	-.0271	3.4678	-.4705
.2250	-.0279	3.9013	-.4838
.2500	-.0284	4.3347	-.4946
.2750	-.0291	4.7682	-.5039
.3000	-.0295	5.2017	-.5110
.3250	-.0298	5.6351	-.5164
.3500	-.0300	6.0686	-.5200
.3750	-.0301	6.5021	-.5220
.4000	-.0301	6.9356	-.5224
.4250	-.0301	7.3690	-.5213
.4500	-.0299	7.8025	-.5186
.4750	-.0297	8.2360	-.5145
.5000	-.0294	8.6694	-.5090
.5250	-.0290	9.1029	-.5020
.5500	-.0285	9.5364	-.4935
.5750	-.0279	9.9699	-.4837
.6000	-.0272	10.4033	-.4724
.6250	-.0265	10.8368	-.4597
.6500	-.0257	11.2703	-.4454
.6750	-.0248	11.7038	-.4297
.7000	-.0238	12.1372	-.4125
.7250	-.0227	12.5707	-.3936

			-.3729
			-.3566
			-.3264
			-.3001
			-.2711
			-.2394
			-.2059
			-.1434
			-.1242
			-.0459
			0.0000

Y= -39.6316 Y/B/2= -.5544 CHORD= 18.7583

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0331 .0247 .0199 .0173 .0168 .0079-.0063-.0079-.0151-.0221-.0291-.0363-.0439-.0524-.0623-.0750-.0947-.1496

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0166	0.0000	-.3107
.0050	-.0137	.4699	-.3501
.0100	-.0203	.9379	-.3892
.0250	-.0326	1.4069	-.4246
.1000	-.0242	1.8759	-.4536
.1250	-.0254	2.3448	-.4774
.1500	-.0265	2.8137	-.4978
.1750	-.0275	3.2827	-.5154
.2000	-.0283	3.7517	-.5304
.2250	-.0289	4.2206	-.5428
.2500	-.0295	4.6896	-.5529
.2750	-.0299	5.1585	-.5609
.3000	-.0302	5.6275	-.5669
.3250	-.0304	6.0964	-.5711
.3500	-.0306	6.5654	-.5735
.3750	-.0306	7.0344	-.5741
.4000	-.0305	7.5033	-.5731
.4250	-.0304	7.9723	-.5706
.4500	-.0302	8.4412	-.5664
.4750	-.0299	8.9102	-.5608
.5000	-.0296	9.3791	-.5536
.5250	-.0291	9.8481	-.5450
.5500	-.0286	10.3171	-.5349
.5750	-.0279	10.7860	-.5235
.6000	-.0272	11.2550	-.5102
.6250	-.0264	11.7239	-.4957
.6500	-.0256	12.1929	-.4796
.6750	-.0246	12.6618	-.4619
.7000	-.0236	13.1308	-.4427
.7250	-.0225	13.5998	-.4218

.7539	-.0213	14.0627	-.3991
.7550	-.0209	14.5377	-.3747
.8065	-.0176	15.0665	-.3483
.8552	-.0179	15.4759	-.3196
.9[illegible]	-.[illegible]	[illegible]	-.2[illegible]
.[illegible]	-.[illegible]	[illegible]	-.[illegible]
.9010	-.0126	[illegible]	-.[illegible]
.9[illegible]	-.[illegible]	17.3914	-.1793
.9550	-.[illegible]	17.9204	-.1313
.9756	-.[illegible]	18.2693	-.0699
1.0000	0.0000	18.7583	0.0000

Y= -35.5705 Y/0/2= -.4990 CHORD= 20.1777

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0749 .0513 .0350 .0223 .0127 .0040-.0038-.0111-.0160-.0247-.0313-.0382-.0454-.0534-.0628-.0749-.0936-.1463

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0101	0.0000	-.3860
.0250	-.0211	.5044	-.4251
.0500	-.0230	1.0089	-.4639
.0750	-.0247	1.5133	-.4969
.1000	-.0261	2.0178	-.5273
.1250	-.0273	2.5222	-.5501
.1500	-.0282	3.0267	-.5695
.1750	-.0290	3.5311	-.5861
.2000	-.0297	4.0355	-.5999
.2250	-.0303	4.5400	-.6110
.2500	-.0307	5.0444	-.6197
.2750	-.0310	5.5489	-.6262
.3000	-.0313	6.0533	-.6307
.3250	-.0314	6.5578	-.6332
.3500	-.0316	7.0622	-.6339
.3750	-.0316	7.5666	-.6328
.4000	-.0317	8.0711	-.6301
.4250	-.0316	8.5755	-.6256
.4500	-.0307	9.0800	-.6196
.4750	-.0303	9.5844	-.6120
.5000	-.0299	10.0888	-.6028
.5250	-.0293	10.5933	-.5921
.5500	-.0287	11.0977	-.5799
.5750	-.0281	11.6022	-.5662
.6000	-.0273	12.1066	-.5510
.6250	-.0265	12.6111	-.5343
.6500	-.0256	13.1155	-.5160
.6750	-.0246	13.6199	-.4961
.7000	-.0235	14.1244	-.4746
.7250	-.0224	14.6288	-.4514

.7500	-.0211	15.1333	-.4264
.7750	-.0196	15.6377	-.3996
.8000	-.0184	16.1422	-.3709
.8250	-.0166	16.6466	-.3399
.8500	-.0152	17.1510	-.3061
.8750	-.0134	17.6555	-.2695
.9000	-.0114	18.1599	-.2309
.9250	-.0094	18.6644	-.1892
.9500	-.0068	19.1688	-.1382
.9750	-.0036	19.6733	-.0731
1.0000	0.0000	20.1777	0.0000

X= -37.7094 Y/B/2= -.4405 CHORD= 21.5971

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1711 .0493 .0295 .0175 .0076-.0009-.0086-.0157-.0224-.0289-.0353-.0418-.0487-.0561-.0649-.0761-.0937-.1439

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0229	0.0000	-.4953
.0250	-.0247	.5399	-.5336
.0500	-.0265	1.0799	-.5714
.0750	-.0269	1.6198	-.6053
.1000	-.0284	2.1597	-.6323
.1250	-.0300	2.6996	-.6537
.1500	-.0311	3.2396	-.6714
.1750	-.0319	3.7795	-.6862
.2000	-.0323	4.3194	-.6982
.2250	-.0327	4.8593	-.7070
.2500	-.0330	5.3993	-.7135
.2750	-.0332	5.9392	-.7177
.3000	-.0333	6.4791	-.7199
.3250	-.0333	7.0191	-.7199
.3500	-.0332	7.5590	-.7180
.3750	-.0331	8.0989	-.7143
.4000	-.0328	8.6388	-.7088
.4250	-.0325	9.1788	-.7016
.4500	-.0321	9.7187	-.6926
.4750	-.0316	10.2586	-.6821
.5000	-.0310	10.7985	-.6699
.5250	-.0303	11.3385	-.6562
.5500	-.0297	11.8784	-.6408
.5750	-.0289	12.4183	-.6240
.6000	-.0280	12.9582	-.6055
.6250	-.0271	13.4982	-.5855
.6500	-.0261	14.0381	-.5639
.6750	-.0250	14.5780	-.5407
.7000	-.0239	15.1179	-.5159
.7250	-.0227	15.6579	-.4893

.7500	-.0213	16.1979	-.4609
.7750	-.0169	16.7577	-.4307
.8000	-.0129	17.2777	-.3986
.8250	-.0169	17.8176	-.3643
.8500	-.0121	18.3575	-.3271
.8750	-.0179	18.8975	-.2872
.9000	-.0114	19.4374	-.2453
.9250	-.0093	19.9773	-.2003
.9500	-.0062	20.5172	-.1459
.9750	-.0035	21.0572	-.0770
1.0000	0.0000	21.5971	0.0000

XX= -38.7324 Y/C/2= -.4019 CHORD= 22.6638

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.7637 .0401 .0248 .0127 .0021-.0066-.0165-.0218-.0258-.0354-.0420-.0487-.0556-.0629-.0713-.0816-.0972-.1434

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0772 .1129 .1503 .2030 .2594 .3250 .4004 .4603 .5427 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0256	0.0000	-.6471
.0250	-.0260	.5666	-.6841
.0500	-.0263	1.1332	-.7208
.0750	-.0333	1.6998	-.7533
.1000	-.0344	2.2664	-.7798
.1250	-.0338	2.8330	-.7983
.1500	-.0359	3.3996	-.8139
.1750	-.0369	3.9662	-.8265
.2000	-.0369	4.5328	-.8359
.2250	-.0372	5.0994	-.8423
.2500	-.0373	5.6660	-.8461
.2750	-.0374	6.2326	-.8479
.3000	-.0374	6.7992	-.8485
.3250	-.0372	7.3658	-.8484
.3500	-.0370	7.9323	-.8481
.3750	-.0367	8.4989	-.8309
.4000	-.0363	9.0655	-.8217
.4250	-.0358	9.6321	-.8107
.4500	-.0352	10.1987	-.7979
.4750	-.0346	10.7653	-.7831
.5000	-.0339	11.3319	-.7668
.5250	-.0330	11.8985	-.7486
.5500	-.0322	12.4651	-.7288
.5750	-.0312	13.0317	-.7074
.6000	-.0302	13.5983	-.6842
.6250	-.0291	14.1649	-.6593
.6500	-.0279	14.7315	-.6328
.6750	-.0267	15.2981	-.6045
.7000	-.0254	15.8647	-.5745
.7250	-.0238	16.4313	-.5428

		16.9579	-.5063
		17.5645	-.4735
		18.1311	-.4361
		18.6977	-.3944
		19.2642	-.3439
		19.8308	-.2807
		20.3974	-.2010
		20.7641	-.1111
		21.5307	-.0506
		22.0973	-.0506
		22.6639	0.0000

Y= -20.7554 Y/B/2= -.3603 CHORD= 24.2323

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0171 .0148 .0191 .0014-.0004-.0037-.0151-.0220-.0230-.0343-.0401-.0459-.0520-.0534-.0658-.0750-.0888-.1276

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1527 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0274	0.0000	-.6693
.0417	-.0291	.0000	-.7047
.0972	-.0305	1.2214	-.7388
.1527	-.0318	1.8174	-.7706
.2083	-.0329	2.4232	-.7942
.2639	-.0332	3.0290	-.8118
.3194	-.0341	3.6349	-.8256
.3750	-.0345	4.2407	-.8352
.4306	-.0348	4.8465	-.8435
.4861	-.0350	5.4523	-.8485
.5417	-.0351	6.0581	-.8509
.5972	-.0351	6.6639	-.8501
.6528	-.0350	7.2697	-.8476
.7083	-.0344	7.8755	-.8429
.7639	-.0345	8.4813	-.8362
.8194	-.0341	9.0871	-.8275
.8750	-.0337	9.6929	-.8170
.9306	-.0332	10.2987	-.8048
.9861	-.0326	10.9046	-.7909
.4700	-.0329	11.5104	-.7751
.5256	-.0319	12.1162	-.7578
.5811	-.0309	12.7220	-.7388
.6367	-.0296	13.3278	-.7183
.6922	-.0282	13.9336	-.6961
.7478	-.0267	14.5394	-.6725
.8033	-.0252	15.1452	-.6472
.8589	-.0236	15.7510	-.6203
.9144	-.0246	16.3568	-.5919
.9700	-.0232	16.9626	-.5618
.5250	-.0219	17.5684	-.5300

ORIGINAL PAGE IS
OF POOR QUALITY

.7[illegible]	-.0[illegible]	18.1743	-.4965
.7[illegible]	-.0[illegible]	18.7401	-.4612
.8[illegible]	-.0[illegible]	19.3059	-.4241
.8[illegible]	-.0159	19.8917	-.3948
.8[illegible]	-.0142	20.3975	-.3630
.9[illegible]	-.0125	21.2033	-.3286
.9[illegible]	-.0[illegible]	21.8091	-.2939
.9[illegible]	-.0[illegible]	22.4149	-.2035
.9[illegible]	-.0[illegible]	23.0207	-.1464
.9[illegible]	-.0[illegible]	23.6265	-.0767
1.0[illegible]	0.0000	24.2323	0.0000

[illegible] -.3049 CHORD= 26.6552

[illegible] AT SLOPE REVERTS FROM FRONT TO REAR

[illegible] -.0277-.0226-.0196-.0277-.0328-.0378-.0428-.0400-.0537-.0602-.0685-.0813-.1175
CONFIGURATION X/C LOCATIONS FROM FRONT TO REAR

[illegible] .3710 .4206 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
[illegible]	-.0217	.0000	-.7121
.0050	-.0220	.0454	-.7402
.0100	[illegible]	1.1329	-.7709
.0250	[illegible]	1.8841	-.8093
.0500	-.0222	2.9655	-.8014
.1000	-.0215	3.3819	-.8473
.1500	[illegible]	3.[illegible]	-.8904
.2000	[illegible]	4.6647	-.8844
.2500	-.0221	5.3310	-.8742
.3000	-.0225	5.9574	-.8771
.4000	-.0227	6.6613	-.8774
.5000	-.0227	7.3202	-.8754
.6000	-.0227	7.9866	-.8711
.7000	-.0225	8.6333	-.8648
.8000	-.0221	9.2292	-.8554
.9000	-.0217	9.8957	-.8483
.9500	-.0211	10.6621	-.8343
.9750	-.0203	11.3595	-.8206
.9900	-.0196	11.9049	-.8052
.9950	-.0192	12.6012	-.7883
.9975	-.0189	13.2276	-.7667
.9990	[illegible]	13.8940	-.7496
.9995	-.0213	14.6401	-.7230
.9999	-.0264	15.3123	-.7049
1.0000	-.0285	15.9931	-.6903
.9990	-.0245	16.6535	-.6542
.9950	-.0232	17.3295	-.6266
.9900	[illegible]	17.9923	-.5975
.9750	-.0221	18.6447	-.5644
.9500	[illegible]	19.2753	-.5345

.7500	-.0169	19.7914	-.5006
.7750	-.0174	20.[illegible]	-.4647
[illegible]	-.0[illegible]	[illegible]	-.4275
[illegible]	-.0[illegible]	21.[illegible]	-.3[illegible]9
[illegible]	-.0[illegible]	22.5597	-.3459
.8750	-.0133	2[illegible].3233	-.3013
.9000	-.0[illegible]6	23.[illegible]7	-.2549
.9250	-.0077	24.5551	-.2057
.9500	-.0056	25.3225	-.1482
.9750	-.0025	25.9936	-.0777
1.0000	0.0000	26.5552	0.0000

Y= -17.9632 Y/MAX= -.2404 CHORD= 29.0731

SLOPES=DZ/DX=AT SLOPE POINTS-FROM FRONT TO REAR

-.0433 -.0031 .0154 .0011-.0065-.0132-.0180-.0241-.0290-.0335-.0380-.0425-.0472-.0522-.0581-.0657-.0775-.1111

X/C LOCATIONS FROM FRONT TO REAR

.0017 .0078 .1039 .2087 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0379	0.0000	-.5082
.0250	-.0239	.7279	-.4402
.0500	-.0300	1.4539	-.8719
.0750	-.0309	2.1809	-.8991
.1000	-.0314	2.9078	-.9169
.1250	-.0321	3.6348	-.9325
.1500	-.0324	4.3618	-.9421
.1750	-.0326	5.0887	-.9486
.2000	-.0327	5.8156	-.9518
.2250	-.0327	6.5426	-.9522
.2500	-.0327	7.2695	-.9498
.2750	-.0329	7.9965	-.9451
.3000	-.0328	8.7234	-.9382
.3250	-.0329	9.4504	-.9292
.3500	-.0326	10.1773	-.9182
.3750	-.0311	10.9043	-.9054
.4000	-.0306	11.6312	-.8908
.4250	-.0301	12.3582	-.8744
.4500	-.0295	13.0851	-.8566
.4750	-.0289	13.8121	-.8369
.5000	-.0281	14.5391	-.8157
.5250	-.0272	15.2660	-.7931
.5500	-.0264	15.9930	-.7689
.5750	-.0256	16.7199	-.7433
.6000	-.0246	17.4469	-.7163
.6250	-.0237	18.1738	-.6878
.6500	-.0226	18.9008	-.6578
.6750	-.0219	19.6277	-.6263
.7000	-.0206	20.3547	-.5933
.7250	-.0193	21.0816	-.5587

.7500	-.0160	21.8006	-.5225
.7750	-.0147	22.5355	-.4847
.8000	-.0132	23.2625	-.4451
.8250	-.0119	23.9834	-.4036
.8500	-.0104	24.7164	-.3592
.8750	-.0087	25.4433	-.3125
.9000	-.0069	26.1703	-.2640
.9250	-.0049	26.8973	-.2127
.9500	-.0028	27.6242	-.1589
.9750	-.0008	28.3512	-.0802
1.0000	0.0000	29.0781	0.0000

YM= -13.5791 Z/2= -.1940 CHORD= 31.5010

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0461 .0772 .0967 -.0997 -.0998 -.0961 -.0892 -.0800 -.0693 -.0575 -.0446 -.0309 -.0165 -.0017 .0134 .0284 .0429 .0566 .0693 .0809 .0911 .0999 .1071 .1128 .1170 .1199 .1217

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

-.0461 -.0772 -.0967 -.0997 -.0998 -.0961 -.0892 -.0800 -.0693 -.0575 -.0446 -.0309 -.0165 -.0017 .0134 .0284 .0429 .0566 .0693 .0809 .0911 .0999 .1071 .1128 .1170 .1199 .1217

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0200	0.0000	-.0423
.0139	-.0408	.7875	-.0713
.0694	-.0817	1.5750	-1.0000
.1250	-.1219	2.3625	-1.0241
.1806	-.1606	3.1501	-1.0406
.2361	-.1972	3.9376	-1.0508
.2917	-.2313	4.7251	-1.0570
.3472	-.2624	5.5127	-1.0600
.4028	-.2904	6.3002	-1.0598
.4583	-.3149	7.0877	-1.0565
.5139	-.3358	7.8752	-1.0505
.5694	-.3531	8.6627	-1.0422
.6250	-.3667	9.4503	-1.0316
.6806	-.3765	10.2378	-1.0189
.7361	-.3826	11.0253	-1.0042
.7917	-.3854	11.8129	-.9877
.8472	-.3849	12.6004	-.9693
.9028	-.3811	13.3879	-.9493
.9583	-.3744	14.1754	-.9277
1.0139	-.3647	14.9630	-.9044
1.0694	-.3523	15.7505	-.8797
1.1250	-.3371	16.5380	-.8534
1.1806	-.3192	17.3255	-.8257
1.2361	-.2988	18.1131	-.7966
1.2917	-.2760	18.9006	-.7661
1.3472	-.2508	19.6881	-.7341
1.4028	-.2233	20.4756	-.7007
1.4583	-.1937	21.2632	-.6659
1.5139	-.1620	22.0507	-.6296
1.5694	-.1284	22.8382	-.5918

.7500	-.0175	23.8257	-.5526
.7750	-.0162	24.4133	-.5114
.8000	-.0149	25.2006	-.4687
.8250	-.0135	25.8433	-.4240
.8500	-.0120	26.7756	-.3768
.8750	-.0104	27.5634	-.3271
.9000	-.0087	28.3509	-.2757
.9250	-.0070	29.1316	-.2216
.9500	-.0050	29.9229	-.1569
.9750	-.0026	30.7135	-.0832
1.0000	0.0000	31.5010	0.0000

(-3.0110 Y/C/2= -.1366 CHORD= 33.9239

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

-.[illegible]-.0[illegible]-.0[illegible]-.0[illegible]-.0[illegible]-.0[illegible]-.0[illegible]-.0393-.0[illegible]-.0425-.0460-.0496-.0536-.0582-.0643-.0741-.1030

[illegible] X/C LOCATIONS, FROM FRONT TO REAR

.0[illegible] .0[illegible] .[illegible] .2003 .2639 .3304 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
[illegible]	-.[illegible]	0.0000	-1.1331
.[illegible]	-.[illegible]	.2491	-1.1375
.[illegible]	-.[illegible]	1.0962	-1.1515
.[illegible]	-.[illegible]	2.5443	-1.2009
.[illegible]	-.[illegible]	3.3924	-1.2126
.[illegible]	-.[illegible]	4.2403	-1.2178
.[illegible]	-.[illegible]	5.0883	-1.2169
.[illegible]	-.[illegible]	5.9367	-1.2167
.[illegible]	-.[illegible]	6.7846	-1.2112
.[illegible]	-.[illegible]	7.6329	-1.2026
.[illegible]	-.[illegible]	8.4810	-1.1913
.2376	-.[illegible]	9.3291	-1.1776
.3009	-.0342	10.1772	-1.1616
.3396	-.0357	11.0255	-1.1435
.3900	-.0381	11.8734	-1.1234
.4359	-.0399	12.7215	-1.1015
.4750	-.0414	13.5697	-1.0776
.5223	-.0413	14.4178	-1.0524
.5750	-.0402	15.2657	-1.0255
.6250	-.0394	16.1138	-.9970
.6750	-.0385	16.9619	-.9670
.7250	-.0376	17.8100	-.9356
.7750	-.0366	18.6581	-.9028
.8250	-.0356	19.5062	-.8686
.8750	-.0346	20.3543	-.8331
.9250	-.0335	21.2024	-.7962
.9750	-.0323	22.0505	-.7580
.7750	-.0312	22.8986	-.7184
.7000	-.0300	23.7467	-.6775
[illegible]	[illegible]	24.5948	-.6351

.7000	-.0174	25.1427	-.5913
.7750	-.0141	24.2910	-.5459
.8500	-.0147	27.1301	-.4893
.9250	-.0133	27.9272	-.4502
.9500	-.0133	28.8303	-.3900
.9750	-.0102	23.4034	-.3434
.9900	-.0084	30.5319	-.2602
.9950	-.0078	31.3709	-.2323
.9990	-.0060	32.2277	-.1461
.9750	-.0026	33.0758	-.0868
1.0000	0.0000	33.9239	0.0000

Y= -5.9433 Y/B/2= -.0832 CHORD= 36.3468

SLOPES, DZ/DX, AT SLOPE POINTS, FROM FRONT TO REAR

.0177 .0003-.0104-.0180-.0253-.0304-.0330-.0339-.0424-.0466-.0483-.0513-.0542-.0574-.0612-.0662-.0747-.1011

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
.0000	-.0497	.0000	-1.4418
.0050	-.0481	.0987	-1.4584
.0500	-.0365	1.8173	-1.4745
.0750	-.0403	2.7260	-1.4858
.1000	-.0419	3.6347	-1.4892
.1250	-.0409	4.5433	-1.4858
.1500	-.0397	5.4520	-1.4781
.1750	-.0399	6.3607	-1.4670
.2000	-.0400	7.2694	-1.4525
.2250	-.0395	8.1780	-1.4349
.2500	-.0389	9.0867	-1.4145
.2750	-.0383	9.9954	-1.3916
.3000	-.0376	10.9040	-1.3665
.3250	-.0368	11.8127	-1.3393
.3500	-.0360	12.7214	-1.3102
.3750	-.0352	13.6300	-1.2792
.4000	-.0343	14.5387	-1.2465
.4250	-.0334	15.4474	-1.2123
.4500	-.0324	16.3560	-1.1765
.4750	-.0314	17.2647	-1.1393
.5000	-.0303	18.1734	-1.1007
.5250	-.0292	19.0820	-1.0609
.5500	-.0281	19.9907	-1.0197
.5750	-.0269	20.8994	-.9774
.6000	-.0257	21.8081	-.9338
.6250	-.0244	22.7167	-.8890
.6500	-.0232	23.6254	-.8431
.6750	-.0219	24.5341	-.7961
.7000	-.0206	25.4427	-.7478

.7933	-.0172	27.2631	-.6475
.7956	-.0169	28.3617	-.5554
.8015	-.0140	29.3774	-.5420
.8142	-.0[illegible]76	30.3[illegible]1	-.4569
.8299	-.0[illegible]15	31.[illegible]47	-.4276
.8[illegible]	-.0102	31.8034	-.3703
.8[illegible]0	-.[illegible]89	32.7121	-.3096
.8[illegible]8	-.[illegible]082	33.6209	-.2465
.9[illegible]3	-.0048	34.5296	-.1793
.9750	-.0025	35.4391	-.0912
1.0000	0.0000	36.3468	0.0000

Y= -1.0947 Y/T/2= -.0278 CHORD= 38.7722

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

-.2046 -.1614 -.0837 -.0417 -.0478 -.0021 -.0054 -.0040 -.0606 -.0627 -.0644 -.0659 -.0672 -.0690 -.0711 -.0742 -.0902 -.1022

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0722 .1279 .2062 .2939 .3794 .4750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
.0000	-.0961	.0000	-2.1743
.0041	-.0960	.0943	-2.1706
.0139	-.0959	1.9296	-2.1664
.0750	-.0956	2.9079	-2.1569
.1389	-.0952	3.9772	-2.1394
.2139	-.0945	4.2465	-2.1125
.2917	-.0937	5.1957	-2.0919
.3556	-.0927	6.7051	-2.0676
.4306	-.0916	7.7644	-2.0101
.4861	-.0908	8.7237	-1.9692
.5417	-.0897	9.6830	-1.9356
.5972	-.0883	10.6623	-1.8796
.6528	-.0872	11.6216	-1.8316
.7083	-.0860	12.6009	-1.7816
.7639	-.0846	13.5702	-1.7209
.8194	-.0832	14.5395	-1.6767
.8750	-.0818	15.5088	-1.6221
.9306	-.0804	16.4782	-1.5662
.9861	-.0789	17.4475	-1.5092
.9972	-.0674	18.4168	-1.4512
1.0000	-.0750	19.3861	-1.3922
1.0028	-.0736	20.3554	-1.3324
1.0056	-.0722	21.3247	-1.2717
1.0083	-.0707	22.2940	-1.2103
1.0111	-.0693	23.2633	-1.1482
1.0139	-.0679	24.2326	-1.0854
1.0167	-.0664	25.2019	-1.0219
1.0194	-.0649	26.1712	-.9578
1.0222	-.0634	27.1406	-.8931
1.0250	-.0619	28.1099	-.8277

.[illegible]	-.0196	29.0721	-.7616
.[illegible]	-.0179	30.[illegible]	-.6548
.[illegible]	-.0163	31.[illegible]	-.5572
.[illegible]	-.0146	31.9870	-.5586
.8550	-.0129	32.9562	-.4686
.[illegible]	-.0102	33.9256	-.4171
.[illegible]	-.[illegible]	34.8949	-.3449
.[illegible]	-.0079	35.[illegible]	-.2712
.[illegible]	-.0062	36.[illegible]	-.1995
.[illegible]	-.[illegible]	37.[illegible]	-.[illegible]
1.0000	0.0000	38.7722	0.0000

```
  1.        1.       20.9696   2353.6296
  0.        0.         0.         0.
30.8332    -0.         6.         1.
-23.7143  -69.34      77.5        1.
-28.3111  -69.8777    77.5        1.
-33.5837  -71.4907     0.         1.
-35.3403  -71.4907    77.5        1.
-32.7053  -69.8777    77.5        1.
-31.8271  -69.34       6.         1.
-14.0067  -27.736      6.         1.
-9.1529   -0.
 100.  18.  20.  0.8  0.5
    1.0
```

Input for Original Design Code of Reference 8

GEOMETRY DATA

REFERENCE PLANFORM HAS 8 CURVES

ROOT CHORD HEIGHT = 0.00000 VARIABLE SWEEP PIVOT POSITION X(S) = 0.00000 Y(S) = 0.00000

BREAK POINTS FOR THE REFERENCE PLANFORM

POINT	X REF	Y REF	SWEEP ANGLE	DIHEDRAL ANGLE	MOVE CODE
1	30.83320	0.00000	38.19097	6.00000	1
2	-23.71430	-69.34000	83.32828	77.50000	1
3	-28.31110	-69.87770	72.99002	77.50000	1
4	-33.58370	-71.49070	90.00000	0.00000	1
5	-35.34030	-71.49070	58.52736	77.50000	1
6	-32.70530	-69.87770	58.52190	77.50000	1
7	-31.82710	-69.34000	23.18709	6.00000	1
8	-14.00670	-27.73600	9.92625	6.00000	1
9	-9.15290	0.00000			

Output for Original Design Code of Reference 8

CONFIGURATION NO. 100.

CURVE 1 IS SWEPT 38.19097 DEGREES ON PLANFORM 1

BREAK POINTS FOR THIS CONFIGURATION

POINT	X	Y	Z	SWEEP ANGLE	DIHEDRAL ANGLE	MOVE CODE
1	30.83320	0.00000	0.00000	38.19097	6.00000	1
2	-23.71430	-69.34000	-7.28793	83.32828	77.50000	1
3	-28.31110	-69.87770	-9.71334	72.99002	77.50000	1
4	-33.58370	-71.49070	-16.98911	90.00000	0.00000	1
5	-35.34030	-71.49070	-16.98911	58.52736	77.50000	1
6	-32.70530	-69.87770	-9.71334	58.52190	77.50000	1
7	-31.82710	-69.34000	-7.28793	23.18709	6.00000	1
8	-14.00670	-27.73600	-2.91517	9.92625	6.00000	1
9	-9.15290	0.00000	0.00000			

378 HORSESHOE VORTICES USED ON THE LEFT HALF OF THE CONFIGURATION

PLANFORM	TOTAL	SPANWISE
1	378	21

18. HORSESHOE VORTICES IN EACH CHORDWISE ROW

MINIMUM FIELD LENGTH = 63000

X C/4	X 3C/4	Y	Z	S	C/4 SWEEP ANGLE	DIHEDRAL ANGLE	GAMMA/U AT CLOES= .5000
-32.20892	-32.27729	-71.05967	-15.04485	1.99147	72.87795	77.50000	.02889
-32.34567	-32.41404	-71.05967	-15.04485	1.99147	72.41497	77.50000	.02889
-32.48241	-32.55079	-71.05967	-15.04485	1.99147	71.92712	77.50000	.02889
-32.61916	-32.68753	-71.05967	-15.04485	1.99147	71.41240	77.50000	.02889
-32.75591	-32.82428	-71.05967	-15.04485	1.99147	70.86864	77.50000	.02889
-32.89265	-32.96102	-71.05967	-15.04485	1.99147	70.29340	77.50000	.02889
-33.02940	-33.09777	-71.05967	-15.04485	1.99147	69.68400	77.50000	.02889
-33.16614	-33.23452	-71.05967	-15.04485	1.99147	69.03746	77.50000	.02889
-33.30289	-33.37126	-71.05967	-15.04485	1.99147	68.35044	77.50000	.02889
-33.43964	-33.50801	-71.05967	-15.04485	1.99147	67.61925	77.50000	.02889
-33.57638	-33.64476	-71.05967	-15.04485	1.99147	66.83975	77.50000	.02889
-33.71313	-33.78150	-71.05967	-15.04485	1.99147	66.00730	77.50000	.02889
-33.84987	-33.91825	-71.05967	-15.04485	1.99147	65.11671	77.50000	.02889
-33.98662	-34.05499	-71.05967	-15.04485	1.99147	64.16215	77.50000	.02889
-34.12337	-34.19174	-71.05967	-15.04485	1.99147	63.13706	77.50000	.02889
-34.26011	-34.32849	-71.05967	-15.04485	1.99147	62.03406	77.50000	.02889
-34.39686	-34.46523	-71.05967	-15.04485	1.99147	60.84483	77.50000	.02889
-34.53361	-34.60198	-71.05967	-15.04485	1.99147	59.56000	77.50000	.02889
-29.59094	-29.69594	-70.25317	-11.40696	1.73475	72.87795	77.50000	.05996
-29.80095	-29.90596	-70.25317	-11.40696	1.73475	72.41497	77.50000	.05996
-30.01096	-30.11597	-70.25317	-11.40696	1.73475	71.92712	77.50000	.05996
-30.22098	-30.32598	-70.25317	-11.40696	1.73475	71.41240	77.50000	.05996
-30.43099	-30.53600	-70.25317	-11.40696	1.73475	70.86864	77.50000	.05996
-30.64100	-30.74601	-70.25317	-11.40696	1.73475	70.29340	77.50000	.05996
-30.85101	-30.95602	-70.25317	-11.40696	1.73475	69.68400	77.50000	.05996
-31.06103	-31.16603	-70.25317	-11.40696	1.73475	69.03746	77.50000	.05996
-31.27104	-31.37605	-70.25317	-11.40696	1.73475	68.35044	77.50000	.05996
-31.48105	-31.58606	-70.25317	-11.40696	1.73475	67.61925	77.50000	.05996
-31.69107	-31.79607	-70.25317	-11.40696	1.73475	66.83975	77.50000	.05996
-31.90108	-32.00608	-70.25317	-11.40696	1.73475	66.00730	77.50000	.05996
-32.11109	-32.21610	-70.25317	-11.40696	1.73475	65.11671	77.50000	.05996
-32.32110	-32.42611	-70.25317	-11.40696	1.73475	64.16215	77.50000	.05996
-32.53112	-32.63612	-70.25317	-11.40696	1.73475	63.13706	77.50000	.05996
-32.74113	-32.84614	-70.25317	-11.40696	1.73475	62.03406	77.50000	.05996
-32.95114	-33.05615	-70.25317	-11.40696	1.73475	60.84483	77.50000	.05996
-33.16116	-33.26616	-70.25317	-11.40696	1.73475	59.56000	77.50000	.05996
-26.09955	-26.27326	-69.60885	-8.50063	1.24215	83.25316	77.50000	.05629
-26.44697	-26.62068	-69.60885	-8.50063	1.24215	82.93507	77.50000	.05629
-26.79439	-26.96810	-69.60885	-8.50063	1.24215	82.58568	77.50000	.05629
-27.14180	-27.31551	-69.60885	-8.50063	1.24215	82.20016	77.50000	.05629
-27.48922	-27.66293	-69.60885	-8.50063	1.24215	81.77264	77.50000	.05629
-27.83664	-28.01035	-69.60885	-8.50063	1.24215	81.29591	77.50000	.05629
-28.18405	-28.35776	-69.60885	-8.50063	1.24215	80.76105	77.50000	.05629

-28.53147	-28.70518	-69.60885	-8.50063	1.24215	80.15684	77.50000	.05629
-28.87889	-29.05260	-69.60885	-8.50063	1.24215	79.46902	77.50000	.05629
-29.22630	-29.40001	-69.60885	-8.50063	1.24215	78.67921	77.50000	.05629
-29.57372	-29.74743	-69.60885	-8.50063	1.24215	77.76326	77.50000	.05629
-29.92114	-30.09485	-69.60885	-8.50063	1.24215	76.68896	77.50000	.05629
-30.26855	-30.44226	-69.60885	-8.50063	1.24215	75.41234	77.50000	.05629
-30.61597	-30.78968	-69.60885	-8.50063	1.24215	73.87202	77.50000	.05629
-30.96339	-31.13710	-69.60885	-8.50063	1.24215	71.98001	77.50000	.05629
-31.31080	-31.48451	-69.60885	-8.50063	1.24215	69.60631	77.50000	.05629
-31.65822	-31.83193	-69.60885	-8.50063	1.24215	66.55259	77.50000	.05629
-32.00564	-32.17935	-69.60885	-8.50063	1.24215	62.50521	77.50000	.05629
-22.27880	-22.52386	-67.35944	-7.07976	1.99147	38.01439	6.00000	.09776
-22.76893	-23.01400	-67.35944	-7.07976	1.99147	37.29953	6.00000	.09776
-23.25907	-23.50414	-67.35944	-7.07976	1.99147	36.57081	6.00000	.09776
-23.74921	-23.99428	-67.35944	-7.07976	1.99147	35.82808	6.00000	.09776
-24.23935	-24.48442	-67.35944	-7.07976	1.99147	35.07118	6.00000	.09776
-24.72949	-24.97456	-67.35944	-7.07976	1.99147	34.29998	6.00000	.09776
-25.21963	-25.46470	-67.35944	-7.07976	1.99147	33.51435	6.00000	.09776
-25.70977	-25.95484	-67.35944	-7.07976	1.99147	32.71419	6.00000	.09776
-26.19991	-26.44498	-67.35944	-7.07976	1.99147	31.89942	6.00000	.09776
-26.69005	-26.93511	-67.35944	-7.07976	1.99147	31.06996	6.00000	.09776
-27.18018	-27.42525	-67.35944	-7.07976	1.99147	30.22577	6.00000	.09776
-27.67032	-27.91539	-67.35944	-7.07976	1.99147	29.36684	6.00000	.09776
-28.16046	-28.40553	-67.35944	-7.07976	1.99147	28.49317	6.00000	.09776
-28.65060	-28.89567	-67.35944	-7.07976	1.99147	27.60480	6.00000	.09776
-29.14074	-29.38581	-67.35944	-7.07976	1.99147	26.70178	6.00000	.09776
-29.63088	-29.87595	-67.35944	-7.07976	1.99147	25.78422	6.00000	.09776
-30.12102	-30.36609	-67.35944	-7.07976	1.99147	24.85224	6.00000	.09776
-30.61116	-30.85623	-67.35944	-7.07976	1.99147	23.90600	6.00000	.09776
-19.18243	-19.46693	-63.39833	-6.66343	1.99147	38.01439	6.00000	.13985
-19.75143	-20.03592	-63.39833	-6.66343	1.99147	37.29953	6.00000	.13985
-20.32042	-20.60492	-63.39833	-6.66343	1.99147	36.57081	6.00000	.13985
-20.88941	-21.17391	-63.39833	-6.66343	1.99147	35.82808	6.00000	.13985
-21.45841	-21.74291	-63.39833	-6.66343	1.99147	35.07118	6.00000	.13985
-22.02740	-22.31190	-63.39833	-6.66343	1.99147	34.29998	6.00000	.13985
-22.59640	-22.88089	-63.39833	-6.66343	1.99147	33.51435	6.00000	.13985
-23.16539	-23.44989	-63.39833	-6.66343	1.99147	32.71419	6.00000	.13985
-23.73439	-24.01888	-63.39833	-6.66343	1.99147	31.89942	6.00000	.13985
-24.30338	-24.58788	-63.39833	-6.66343	1.99147	31.06996	6.00000	.13985
-24.87237	-25.15687	-63.39833	-6.66343	1.99147	30.22577	6.00000	.13985
-25.44137	-25.72587	-63.39833	-6.66343	1.99147	29.36684	6.00000	.13985
-26.01036	-26.29486	-63.39833	-6.66343	1.99147	28.49317	6.00000	.13985
-26.57936	-26.86386	-63.39833	-6.66343	1.99147	27.60480	6.00000	.13985
-27.14835	-27.43285	-63.39833	-6.66343	1.99147	26.70178	6.00000	.13985
-27.71735	-28.00184	-63.39833	-6.66343	1.99147	25.78422	6.00000	.13985
-28.28634	-28.57084	-63.39833	-6.66343	1.99147	24.85224	6.00000	.13985
-28.85534	-29.13983	-63.39833	-6.66343	1.99147	23.90600	6.00000	.13985
-16.08607	-16.40999	-59.43721	-6.24710	1.99147	38.01439	6.00000	.16562
-16.73392	-17.05784	-59.43721	-6.24710	1.99147	37.29953	6.00000	.16562

-17.38177	-17.70569	-59.43721	-6.24710	1.99147	36.57081	6.00000	.16562
-18.62962	-18.35354	-59.43721	-6.24710	1.99147	35.82808	6.00000	.16562
-18.67747	-19.00139	-59.43721	-6.24710	1.99147	35.07118	6.00000	.16562
-19.32532	-19.64924	-59.43721	-6.24710	1.99147	34.29998	6.00000	.16562
-19.97317	-20.29709	-59.43721	-6.24710	1.99147	33.51435	6.00000	.16562
-20.62102	-20.94494	-59.43721	-6.24710	1.99147	32.71419	6.00000	.16562
-21.26887	-21.59279	-59.43721	-6.24710	1.99147	31.89942	6.00000	.16562
-21.91672	-22.24064	-59.43721	-6.24710	1.99147	31.06996	6.00000	.16562
-22.56457	-22.88849	-59.43721	-6.24710	1.99147	30.22577	6.00000	.16562
-23.21242	-23.53634	-59.43721	-6.24710	1.99147	29.36684	6.00000	.16562
-23.86027	-24.18419	-59.43721	-6.24710	1.99147	28.49317	6.00000	.16562
-24.50811	-24.83204	-59.43721	-6.24710	1.99147	27.60480	6.00000	.16562
-25.15596	-25.47989	-59.43721	-6.24710	1.99147	26.70178	6.00000	.16562
-25.80381	-26.12774	-59.43721	-6.24710	1.99147	25.78422	6.00000	.16562
-26.45166	-26.77559	-59.43721	-6.24710	1.99147	24.85224	6.00000	.16562
-27.09951	-27.42344	-59.43721	-6.24710	1.99147	23.90600	6.00000	.16562
-12.98970	-13.35305	-55.47610	-5.83077	1.99147	38.01439	6.00000	.18646
-13.71641	-14.07976	-55.47610	-5.83077	1.99147	37.29953	6.00000	.18646
-14.44311	-14.80647	-55.47610	-5.83077	1.99147	36.57081	6.00000	.18646
-15.16982	-15.53317	-55.47610	-5.83077	1.99147	35.82808	6.00000	.18646
-15.89652	-16.25988	-55.47610	-5.83077	1.99147	35.07118	6.00000	.18646
-16.62323	-16.98658	-55.47610	-5.83077	1.99147	34.29998	6.00000	.18646
-17.34993	-17.71329	-55.47610	-5.83077	1.99147	33.51435	6.00000	.18646
-18.07664	-18.43999	-55.47610	-5.83077	1.99147	32.71419	6.00000	.18646
-18.80335	-19.16670	-55.47610	-5.83077	1.99147	31.89942	6.00000	.18646
-19.53005	-19.89340	-55.47610	-5.83077	1.99147	31.06996	6.00000	.18646
-20.25676	-20.62011	-55.47610	-5.83077	1.99147	30.22577	6.00000	.18646
-20.98346	-21.34681	-55.47610	-5.83077	1.99147	29.36684	6.00000	.18646
-21.71017	-22.07352	-55.47610	-5.83077	1.99147	28.49317	6.00000	.18646
-22.43687	-22.80022	-55.47610	-5.83077	1.99147	27.60480	6.00000	.18646
-23.16358	-23.52693	-55.47610	-5.83077	1.99147	26.70178	6.00000	.18646
-23.89028	-24.25364	-55.47610	-5.83077	1.99147	25.78422	6.00000	.18646
-24.61699	-24.98034	-55.47610	-5.83077	1.99147	24.85224	6.00000	.18646
-25.34369	-25.70705	-55.47610	-5.83077	1.99147	23.90600	6.00000	.18646
-9.89334	-10.29612	-51.51499	-5.41444	1.99147	38.01439	6.00000	.20387
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-11.50446	-11.90724	-51.51499	-5.41444	1.99147	36.57081	6.00000	.20387
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-14.72670	-15.12948	-51.51499	-5.41444	1.99147	33.51435	6.00000	.20387
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-19.56007	-19.96285	-51.51499	-5.41444	1.99147	28.49317	6.00000	.20387
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-11.21905	-11.66126	-47.55387	-4.99811	1.99147	34.29998	6.00000	.21880
-12.10347	-12.54568	-47.55387	-4.99811	1.99147	33.51435	6.00000	.21880
-12.98789	-13.43010	-47.55387	-4.99811	1.99147	32.71419	6.00000	.21880
-13.87230	-14.31451	-47.55387	-4.99811	1.99147	31.89942	6.00000	.21880
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-19.17880	-19.62101	-47.55387	-4.99811	1.99147	26.70178	6.00000	.21880
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-3.70061	-4.18224	-43.59276	-4.58178	1.99147	38.01439	6.00000	.23172
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-7.55370	-8.03533	-43.59276	-4.58178	1.99147	35.07118	6.00000	.23172
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-9.48024	-9.96188	-43.59276	-4.58178	1.99147	33.51435	6.00000	.23172
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-16.22314	-16.70478	-43.59276	-4.58178	1.99147	27.60480	6.00000	.23172
-17.18642	-17.66805	-43.59276	-4.58178	1.99147	26.70178	6.00000	.23172
-18.14969	-18.63132	-43.59276	-4.58178	1.99147	25.78422	6.00000	.23172
-19.11296	-19.59460	-43.59276	-4.58178	1.99147	24.85224	6.00000	.23172
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-.60424	-1.12531	-39.63164	-4.16545	1.99147	38.01439	6.00000	.24290
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-11.02552	-11.54658	-39.63164	-4.16545	1.99147	30.22577	6.00000	.24290
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-14.15190	-14.67296	-39.63164	-4.16545	1.99147	27.60480	6.00000	.24290
-15.19403	-15.71509	-39.63164	-4.16545	1.99147	26.70178	6.00000	.24290
-16.23616	-16.75722	-39.63164	-4.16545	1.99147	25.78422	6.00000	.24290
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2.49212	1.93163	-35.67053	-3.74912	1.99147	38.01439	6.00000	.25264
1.37114	.81065	-35.67053	-3.74912	1.99147	37.29953	6.00000	.25264
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-5.35476	-5.91525	-35.67053	-3.74912	1.99147	32.71419	6.00000	.25264
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5.56849	4.98957	-31.70941	-3.33279	1.99147	38.01439	6.00000	.26104
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1.98897	1.38905	-31.70941	-3.33279	1.99147	35.82808	6.00000	.26104
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7.91557	7.28602	-28.73243	-3.01990	1.00192	38.01439	6.00000	.26658
6.65646	6.02691	-28.73243	-3.01990	1.00192	37.29953	6.00000	.26658
5.39736	4.76781	-28.73243	-3.01990	1.00192	36.57081	6.00000	.26658
4.13826	3.50871	-28.73243	-3.01990	1.00192	35.82808	6.00000	.26658
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1.62005	.99050	-28.73243	-3.01990	1.00192	34.29998	6.00000	.26658
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10.23568	9.56256	-25.75544	-2.70701	1.99147	37.88905	6.00000	.27148
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7.54320	6.87008	-25.75544	-2.70701	1.99147	35.38270	6.00000	.27148
6.19696	5.52383	-25.75544	-2.70701	1.99147	34.06763	6.00000	.27148
4.85071	4.17759	-25.75544	-2.70701	1.99147	32.71043	6.00000	.27148
3.50447	2.83135	-25.75544	-2.70701	1.99147	31.31065	6.00000	.27148
2.15823	1.48511	-25.75544	-2.70701	1.99147	29.86801	6.00000	.27148
.81199	.13887	-25.75544	-2.70701	1.99147	28.38241	6.00000	.27148
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13.31811	12.57768	-21.79433	-2.29068	1.99147	37.88905	6.00000	.27706
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5.91388	5.17345	-21.79433	-2.29068	1.99147	31.31065	6.00000	.27706
4.43303	3.69261	-21.79433	-2.29068	1.99147	29.86801	6.00000	.27706
2.95219	2.21176	-21.79433	-2.29068	1.99147	28.38241	6.00000	.27706
1.47134	.73092	-21.79433	-2.29068	1.99147	26.85399	6.00000	.27706
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5.09238	4.28465	-17.83321	-1.87435	1.99147	28.38241	6.00000	.28166
3.47693	2.66920	-17.83321	-1.87435	1.99147	26.85399	6.00000	.28166
1.86148	1.05375	-17.83321	-1.87435	1.99147	25.28316	6.00000	.28166
.24603	-.56170	-17.83321	-1.87435	1.99147	23.67056	6.00000	.28166
-1.36942	-2.17715	-17.83321	-1.87435	1.99147	22.01719	6.00000	.28166
-2.98487	-3.79260	-17.83321	-1.87435	1.99147	20.32431	6.00000	.28166
-4.60032	-5.40805	-17.83321	-1.87435	1.99147	18.59357	6.00000	.28166
-6.21577	-7.02350	-17.83321	-1.87435	1.99147	16.82693	6.00000	.28166
-7.83122	-8.63895	-17.83321	-1.87435	1.99147	15.02672	6.00000	.28166
-9.44667	-10.25440	-17.83321	-1.87435	1.99147	13.19564	6.00000	.28166
-11.06212	-11.86985	-17.83321	-1.87435	1.99147	11.33671	6.00000	.28166
19.48296	18.60793	-13.87210	-1.45802	1.99147	37.88905	6.00000	.28531
17.73291	16.85788	-13.87210	-1.45802	1.99147	36.65626	6.00000	.28531
15.98285	15.10782	-13.87210	-1.45802	1.99147	35.38270	6.00000	.28531
14.23280	13.35777	-13.87210	-1.45802	1.99147	34.06763	6.00000	.28531
12.48274	11.60771	-13.87210	-1.45802	1.99147	32.71043	6.00000	.28531
10.73269	9.85766	-13.87210	-1.45802	1.99147	31.31065	6.00000	.28531
8.98263	8.10760	-13.87210	-1.45802	1.99147	29.86801	6.00000	.28531
7.23258	6.35755	-13.87210	-1.45802	1.99147	28.38241	6.00000	.28531
5.48252	4.60749	-13.87210	-1.45802	1.99147	26.85399	6.00000	.28531
3.73246	2.85744	-13.87210	-1.45802	1.99147	25.28316	6.00000	.28531
1.98241	1.10738	-13.87210	-1.45802	1.99147	23.67056	6.00000	.28531
.23235	-.64267	-13.87210	-1.45802	1.99147	22.01719	6.00000	.28531
-1.51770	-2.39273	-13.87210	-1.45802	1.99147	20.32431	6.00000	.28531
-3.26776	-4.14278	-13.87210	-1.45802	1.99147	18.59357	6.00000	.28531
-5.01781	-5.89284	-13.87210	-1.45802	1.99147	16.82693	6.00000	.28531
-6.76787	-7.64289	-13.87210	-1.45802	1.99147	15.02672	6.00000	.28531
-8.51792	-9.39295	-13.87210	-1.45802	1.99147	13.19564	6.00000	.28531
-10.26798	-11.14300	-13.87210	-1.45802	1.99147	11.33671	6.00000	.28531
22.56539	21.62306	-9.91099	-1.04169	1.99147	37.88905	6.00000	.28802
20.68073	19.73840	-9.91099	-1.04169	1.99147	36.65626	6.00000	.28802
18.79607	17.85374	-9.91099	-1.04169	1.99147	35.38270	6.00000	.28802
16.91141	15.96908	-9.91099	-1.04169	1.99147	34.06763	6.00000	.28802
15.02675	14.08442	-9.91099	-1.04169	1.99147	32.71043	6.00000	.28802
13.14209	12.19976	-9.91099	-1.04169	1.99147	31.31065	6.00000	.28802
11.25743	10.31510	-9.91099	-1.04169	1.99147	29.86801	6.00000	.28802
9.37277	8.43044	-9.91099	-1.04169	1.99147	28.38241	6.00000	.28802
7.48811	6.54578	-9.91099	-1.04169	1.99147	26.85399	6.00000	.28802
5.60345	4.66112	-9.91099	-1.04169	1.99147	25.28316	6.00000	.28802
3.71879	2.77646	-9.91099	-1.04169	1.99147	23.67056	6.00000	.28802
1.83413	.89180	-9.91099	-1.04169	1.99147	22.01719	6.00000	.28802
-.05053	-.99286	-9.91099	-1.04169	1.99147	20.32431	6.00000	.28802

-1.93519	-2.87752	-9.91099	-1.04169	1.99147	18.59357	6.00000	.28802
-3.81985	-4.76218	-9.91099	-1.04169	1.99147	16.82693	6.00000	.28802
-5.70451	-6.64684	-9.91099	-1.04169	1.99147	15.02672	6.00000	.28802
-7.58917	-8.53150	-9.91099	-1.04169	1.99147	13.19564	6.00000	.28802
-9.47383	-10.41616	-9.91099	-1.04169	1.99147	11.33671	6.00000	.28802
25.64782	24.63818	-5.94987	-.62536	1.99147	37.88905	6.00000	.28986
23.62855	22.61892	-5.94987	-.62536	1.99147	36.65626	6.00000	.28986
21.60929	20.59965	-5.94987	-.62536	1.99147	35.38270	6.00000	.28986
19.59002	18.58039	-5.94987	-.62536	1.99147	34.06763	6.00000	.28986
17.57076	16.56113	-5.94987	-.62536	1.99147	32.71043	6.00000	.28986
15.55149	14.54186	-5.94987	-.62536	1.99147	31.31065	6.00000	.28986
13.53223	12.52260	-5.94987	-.62536	1.99147	29.86801	6.00000	.28986
11.51296	10.50333	-5.94987	-.62536	1.99147	28.38241	6.00000	.28986
9.49370	8.48407	-5.94987	-.62536	1.99147	26.85399	6.00000	.28986
7.47444	6.46480	-5.94987	-.62536	1.99147	25.28316	6.00000	.28986
5.45517	4.44554	-5.94987	-.62536	1.99147	23.67056	6.00000	.28986
3.43591	2.42627	-5.94987	-.62536	1.99147	22.01719	6.00000	.28986
1.41664	.40701	-5.94987	-.62536	1.99147	20.32431	6.00000	.28986
-.60262	-1.61225	-5.94987	-.62536	1.99147	18.59357	6.00000	.28986
-2.62189	-3.63152	-5.94987	-.62536	1.99147	16.82693	6.00000	.28986
-4.64115	-5.65078	-5.94987	-.62536	1.99147	15.02672	6.00000	.28986
-6.66041	-7.67005	-5.94987	-.62536	1.99147	13.19564	6.00000	.28986
-8.67968	-9.68931	-5.94987	-.62536	1.99147	11.33671	6.00000	.28986
28.73343	27.65643	-1.98466	-.20860	1.99559	37.88905	6.00000	.29076
26.57942	25.50242	-1.98466	-.20860	1.99559	36.65626	6.00000	.29076
24.42542	23.34841	-1.98466	-.20860	1.99559	35.38270	6.00000	.29076
22.27141	21.19440	-1.98466	-.20860	1.99559	34.06763	6.00000	.29076
20.11740	19.04040	-1.98466	-.20860	1.99559	32.71043	6.00000	.29076
17.96339	16.88639	-1.98466	-.20860	1.99559	31.31065	6.00000	.29076
15.80938	14.73238	-1.98466	-.20860	1.99559	29.86801	6.00000	.29076
13.65537	12.57837	-1.98466	-.20860	1.99559	28.38241	6.00000	.29076
11.50137	10.42436	-1.98466	-.20860	1.99559	26.85399	6.00000	.29076
9.34736	8.27035	-1.98466	-.20860	1.99559	25.28316	6.00000	.29076
7.19335	6.11635	-1.98466	-.20860	1.99559	23.67056	6.00000	.29076
5.03934	3.96234	-1.98466	-.20860	1.99559	22.01719	6.00000	.29076
2.88533	1.80833	-1.98466	-.20860	1.99559	20.32431	6.00000	.29076
.73132	-.34568	-1.98466	-.20860	1.99559	18.59357	6.00000	.29076
-1.42268	-2.49969	-1.98466	-.20860	1.99559	16.82693	6.00000	.29076
-3.57669	-4.65370	-1.98466	-.20860	1.99559	15.02672	6.00000	.29076
-5.73070	-6.80770	-1.98466	-.20860	1.99559	13.19564	6.00000	.29076
-7.88471	-8.96171	-1.98466	-.20860	1.99559	11.33671	6.00000	.29076

REF. CHORD	C AVERAGE	TRUE AREA	REFFRENCE AREA	B/2	REF. AR	TRUE AR	MACH NUMBER
20.96960	21.39785	3059.49486	2353.62960	71.49070	8.68602	6.68204	.80000

FIRST PLANFORM SPAN LOADING

Y	CL*C
-71.05967	.22514
-70.25317	.46723
-69.60885	.43858
-67.35944	3.49994
-63.39833	5.00692
-59.43721	5.92968
-55.47610	6.67577
-51.51499	7.29915
-47.55387	7.83347
-43.59276	8.29622
-39.63164	8.69643
-35.67053	9.04525
-31.70941	9.34595
-28.73243	9.54440
-25.75544	9.71972
-21.79433	9.91962
-17.83321	10.08410
-13.87210	10.21487
-9.91099	10.31195
-5.94987	10.37792
-1.98466	10.40996

CL DEVELOPED ON THIS PLANFORM= .502247
CM DEVELOPED ON THIS PLANFORM= -.112756

CL DESIGN = .500000 CL COMPUTED= .502247 CM COMPUTED= -.112756 CD V= .009034

LOCAL ELEVATION DATA

Y= -71.0597 Y/B/2= -.9940 CHORD= 2.4614

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.6355 .5304 .4646 .4156 .3758 .3415 .3108 .2823 .2551 .2284 .2014 .1734 .1433 .1098 .0702 .0191-.0599-.2813

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
-.0000	.2471	-.0000	.6082
.0250	.2311	.0615	.5689
.0500	.2152	.1231	.5298
.0750	.2001	.1846	.4926
.1000	.1864	.2461	.4587
.1250	.1737	.3077	.4276
.1500	.1617	.3692	.3981
.1750	.1504	.4308	.3701
.2000	.1395	.4923	.3434
.2250	.1292	.5538	.3180
.2500	.1194	.6154	.2938
.2750	.1099	.6769	.2706
.3000	.1009	.7384	.2484
.3250	.0923	.8000	.2271
.3500	.0840	.8615	.2068
.3750	.0761	.9230	.1872
.4000	.0685	.9846	.1685
.4250	.0612	1.0461	.1506
.4500	.0542	1.1076	.1334
.4750	.0475	1.1692	.1170
.5000	.0412	1.2307	.1013
.5250	.0351	1.2923	.0864
.5500	.0294	1.3538	.0722
.5750	.0239	1.4153	.0588
.6000	.0187	1.4769	.0461
.6250	.0139	1.5384	.0342
.6500	.0094	1.5999	.0230

.6750	.0052	1.6615	.0127
.7000	.0013	1.7230	.0032
.7250	-.0022	1.7845	-.0055
.7500	-.0054	1.8461	-.0133
.7750	-.0082	1.9076	-.0201
.8000	-.0105	1.9691	-.0259
.8250	-.0124	2.0307	-.0306
.8500	-.0137	2.0922	-.0338
.8750	-.0144	2.1538	-.0356
.9000	-.0147	2.2153	-.0363
.9250	-.0144	2.2768	-.0354
.9500	-.0121	2.3384	-.0298
.9750	-.0069	2.3999	-.0170
1.0000	0.0000	2.4614	0.0000

Y= -70.2532 Y/B/2= -.9827 CHORD= 3.7802

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.6965 .5482 .4529 .3800 .3193 .2658 .2167 .1705 .1258 .0817 .0373-.0084-.0566-.1091-.1694-.2448-.3573-.6618

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
-.0000	.1128	-.0000	.4264
.0250	.0953	.0945	.3602
.0500	.0778	.1890	.2943
.0750	.0615	.2835	.2326
.1000	.0471	.3780	.1781
.1250	.0343	.4725	.1295
.1500	.0224	.5670	.0848
.1750	.0114	.6615	.0432
.2000	.0013	.7560	.0048
.2250	-.0081	.8506	-.0307
.2500	-.0168	.9451	-.0634
.2750	-.0248	1.0396	-.0937
.3000	-.0322	1.1341	-.1217
.3250	-.0390	1.2286	-.1474
.3500	-.0452	1.3231	-.1710
.3750	-.0509	1.4176	-.1925
.4000	-.0561	1.5121	-.2120
.4250	-.0607	1.6066	-.2295
.4500	-.0648	1.7011	-.2451
.4750	-.0685	1.7956	-.2588
.5000	-.0716	1.8901	-.2705
.5250	-.0742	1.9846	-.2805
.5500	-.0763	2.0791	-.2885
.5750	-.0779	2.1736	-.2946
.6000	-.0791	2.2681	-.2989
.6250	-.0797	2.3626	-.3013
.6500	-.0798	2.4571	-.3017
.6750	-.0794	2.5517	-.3001
.7000	-.0784	2.6462	-.2965
.7250	-.0769	2.7407	-.2908

.7500	-.0748	2.8352	-.2829
.7750	-.0721	2.9297	-.2727
.8000	-.0688	3.0242	-.2602
.8250	-.0648	3.1187	-.2450
.8500	-.0599	3.2132	-.2265
.8750	-.0542	3.3077	-.2047
.9000	-.0478	3.4022	-.1806
.9250	-.0404	3.4967	-.1528
.9500	-.0304	3.5912	-.1150
.9750	-.0164	3.6857	-.0618
1.0000	0.0000	3.7802	0.0000

Y= -69.6089 Y/B/2= -.9737 CHORD= 6.2535

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.7046 .5460 .4554 .3956 .3539 .3249 .3056 .2941 .2884 .2867 .2872 .2884 .2888 .2863 .2778 .2579 .2142 .0616

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
-.0000	.3377	-.0000	2.1118
.0250	.3200	.1563	2.0009
.0500	.3023	.3127	1.8907
.0750	.2859	.4690	1.7880
.1000	.2715	.6254	1.6979
.1250	.2587	.7817	1.6179
.1500	.2469	.9380	1.5440
.1750	.2358	1.0944	1.4745
.2000	.2254	1.2507	1.4093
.2250	.2156	1.4070	1.3480
.2500	.2063	1.5634	1.2899
.2750	.1974	1.7197	1.2344
.3000	.1889	1.8761	1.1812
.3250	.1807	2.0324	1.1299
.3500	.1727	2.1887	1.0803
.3750	.1650	2.3451	1.0319
.4000	.1575	2.5014	.9846
.4250	.1500	2.6577	.9382
.4500	.1427	2.8141	.8923
.4750	.1354	2.9704	.8470
.5000	.1282	3.1268	.8019
.5250	.1210	3.2831	.7570
.5500	.1139	3.4394	.7121
.5750	.1067	3.5958	.6673
.6000	.0995	3.7521	.6225
.6250	.0924	3.9084	.5775
.6500	.0851	4.0648	.5325
.6750	.0779	4.2211	.4874
.7000	.0707	4.3775	.4422
.7250	.0635	4.5338	.3971

.7500	.0563	4.6901	.3521
.7750	.0491	4.8465	.3073
.8000	.0420	5.0028	.2629
.8250	.0350	5.1591	.2192
.8500	.0283	5.3155	.1768
.8750	.0217	5.4718	.1360
.9000	.0153	5.6282	.0960
.9250	.0093	5.7845	.0579
.9500	.0044	5.9408	.0277
.9750	.0016	6.0972	.0102
1.0000	0.0000	6.2535	0.0000

Y= -67.3594 Y/B/2= -.9422 CHORD= 8.8225

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1142 .0922 .0785 .0681 .0592 .0511 .0437 .0368 .0302 .0238 .0176 .0113 .0048-.0022-.0104-.0209-.0375-.0849

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	.0292	0.0000	.2578
.0250	.0264	.2206	.2325
.0500	.0235	.4411	.2073
.0750	.0208	.6617	.1835
.1000	.0184	.8822	.1622
.1250	.0162	1.1028	.1430
.1500	.0142	1.3234	.1251
.1750	.0123	1.5439	.1081
.2000	.0105	1.7645	.0923
.2250	.0088	1.9851	.0774
.2500	.0072	2.2056	.0635
.2750	.0057	2.4262	.0504
.3000	.0043	2.6467	.0381
.3250	.0030	2.8673	.0266
.3500	.0018	3.0879	.0159
.3750	.0007	3.3084	.0059
.4000	-.0004	3.5290	-.0034
.4250	-.0014	3.7496	-.0120
.4500	-.0023	3.9701	-.0200
.4750	-.0031	4.1907	-.0272
.5000	-.0038	4.4112	-.0339
.5250	-.0045	4.6318	-.0398
.5500	-.0051	4.8524	-.0452
.5750	-.0057	5.0729	-.0499
.6000	-.0061	5.2935	-.0540
.6250	-.0065	5.5141	-.0575
.6500	-.0068	5.7346	-.0604
.6750	-.0071	5.9552	-.0627
.7000	-.0073	6.1757	-.0643
.7250	-.0074	6.3963	-.0652

.7500	-.0074	6.6169	-.0655
.7750	-.0074	6.8374	-.0651
.8000	-.0072	7.0580	-.0639
.8250	-.0070	7.2786	-.0619
.8500	-.0067	7.4991	-.0588
.8750	-.0062	7.7197	-.0546
.9000	-.0056	7.9402	-.0497
.9250	-.0049	8.1608	-.0435
.9500	-.0038	8.3814	-.0338
.9750	-.0021	8.6019	-.0185
1.0000	0.0000	8.8225	0.0000

Y= -63.3983 Y/B/2= -.8868 CHORD= 10.2419

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1166 .0886 .0709 .0574 .0460 .0359 .0264 .0174 .0086-.0002-.0092-.0184-.0283-.0391-.0516-.0672-.0902-.1513

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	.0044	0.0000	.0455
.0250	.0015	.2560	.0155
.0500	-.0014	.5121	-.0144
.0750	-.0041	.7681	-.0421
.1000	-.0065	1.0242	-.0662
.1250	-.0085	1.2802	-.0872
.1500	-.0104	1.5363	-.1063
.1750	-.0121	1.7923	-.1239
.2000	-.0137	2.0484	-.1398
.2250	-.0151	2.3044	-.1543
.2500	-.0163	2.5605	-.1674
.2750	-.0175	2.8165	-.1793
.3000	-.0185	3.0726	-.1899
.3250	-.0195	3.3286	-.1994
.3500	-.0203	3.5847	-.2078
.3750	-.0210	3.8407	-.2151
.4000	-.0216	4.0968	-.2214
.4250	-.0221	4.3528	-.2266
.4500	-.0225	4.6089	-.2308
.4750	-.0228	4.8649	-.2339
.5000	-.0230	5.1209	-.2361
.5250	-.0232	5.3770	-.2372
.5500	-.0232	5.6330	-.2373
.5750	-.0231	5.8891	-.2364
.6000	-.0229	6.1451	-.2345
.6250	-.0226	6.4012	-.2315
.6500	-.0222	6.6572	-.2274
.6750	-.0217	6.9133	-.2223
.7000	-.0211	7.1693	-.2160
.7250	-.0204	7.4254	-.2085

.7500	-.0195	7.6814	-.1999
.7750	-.0185	7.9375	-.1899
.8000	-.0174	8.1935	-.1787
.8250	-.0162	8.4496	-.1659
.8500	-.0148	8.7056	-.1513
.8750	-.0132	8.9617	-.1349
.9000	-.0114	9.2177	-.1171
.9250	-.0095	9.4738	-.0973
.9500	-.0070	9.7298	-.0720
.9750	-.0037	9.9859	-.0383
1.0000	0.0000	10.2419	0.0000

Y= -59.4372 Y/B/2= -.8314 CHORD= 11.6613

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1139 .0846 .0662 .0523 .0407 .0305 .0211 .0123 .0038-.0046-.0132-.0221-.0315-.0420-.0542-.0696-.0929-.1558

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	.0004	0.0000	.0050
.0250	-.0024	.2915	-.0285
.0500	-.0053	.5831	-.0617
.0750	-.0079	.8746	-.0924
.1000	-.0102	1.1661	-.1187
.1250	-.0121	1.4577	-.1414
.1500	-.0139	1.7492	-.1619
.1750	-.0155	2.0407	-.1805
.2000	-.0169	2.3323	-.1972
.2250	-.0182	2.6238	-.2122
.2500	-.0193	2.9153	-.2255
.2750	-.0204	3.2069	-.2375
.3000	-.0213	3.4984	-.2480
.3250	-.0221	3.7899	-.2573
.3500	-.0227	4.0815	-.2652
.3750	-.0233	4.3730	-.2720
.4000	-.0238	4.6645	-.2776
.4250	-.0242	4.9561	-.2820
.4500	-.0245	5.2476	-.2853
.4750	-.0246	5.5391	-.2874
.5000	-.0247	5.8306	-.2885
.5250	-.0247	6.1222	-.2884
.5500	-.0246	6.4137	-.2872
.5750	-.0244	6.7052	-.2850
.6000	-.0241	6.9968	-.2816
.6250	-.0238	7.2883	-.2770
.6500	-.0233	7.5798	-.2713
.6750	-.0227	7.8714	-.2644
.7000	-.0220	8.1629	-.2563
.7250	-.0212	8.4544	-.2469

.7500	-.0202	8.7460	-.2361
.7750	-.0192	9.0375	-.2239
.8000	-.0180	9.3290	-.2103
.8250	-.0167	9.6206	-.1951
.8500	-.0152	9.9121	-.1777
.8750	-.0136	10.2036	-.1583
.9000	-.0118	10.4952	-.1373
.9250	-.0098	10.7867	-.1141
.9500	-.0072	11.0782	-.0844
.9750	-.0039	11.3698	-.0450
1.0000	0.0000	11.6613	0.0000

Y= -55.4761 Y/B/2= -.7760 CHORD= 13.0807

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1093 .0798 .0612 .0471 .0355 .0252 .0159 .0072-.0012-.0095-.0178-.0265-.0357-.0459-.0578-.0729-.0959-.1587

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0040	0.0000	-.0529
.0250	-.0068	.3270	-.0890
.0500	-.0095	.6540	-.1247
.0750	-.0120	.9811	-.1576
.1000	-.0142	1.3081	-.1856
.1250	-.0160	1.6351	-.2095
.1500	-.0176	1.9621	-.2308
.1750	-.0191	2.2891	-.2500
.2000	-.0204	2.6161	-.2671
.2250	-.0216	2.9432	-.2822
.2500	-.0226	3.2702	-.2955
.2750	-.0235	3.5972	-.3072
.3000	-.0243	3.9242	-.3173
.3250	-.0249	4.2512	-.3260
.3500	-.0255	4.5782	-.3332
.3750	-.0259	4.9053	-.3391
.4000	-.0263	5.2323	-.3436
.4250	-.0265	5.5593	-.3469
.4500	-.0267	5.8863	-.3489
.4750	-.0267	6.2133	-.3497
.5000	-.0267	6.5403	-.3493
.5250	-.0266	6.8674	-.3476
.5500	-.0264	7.1944	-.3447
.5750	-.0260	7.5214	-.3406
.6000	-.0256	7.8484	-.3352
.6250	-.0251	8.1754	-.3286
.6500	-.0245	8.5025	-.3208
.6750	-.0238	8.8295	-.3116
.7000	-.0230	9.1565	-.3011
.7250	-.0221	9.4835	-.2892

.7500	-.0211	9.8105	-.2758
.7750	-.0199	10.1375	-.2609
.8000	-.0187	10.4646	-.2444
.8250	-.0173	10.7916	-.2261
.8500	-.0157	11.1186	-.2054
.8750	-.0140	11.4456	-.1825
.9000	-.0121	11.7726	-.1580
.9250	-.0100	12.0996	-.1309
.9500	-.0074	12.4267	-.0966
.9750	-.0039	12.7537	-.0514
1.0000	0.0000	13.0807	0.0000

Y= -51.5150 Y/B/2= -.7206 CHORD= 14.5001

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.1039 .0747 .0563 .0424 .0308 .0208 .0116 .0031-.0051-.0132-.0213-.0297-.0386-.0485-.0600-.0748-.0972-.1589

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0076	0.0000	-.1105
.0250	-.0102	.3625	-.1485
.0500	-.0128	.7250	-.1862
.0750	-.0152	1.0875	-.2208
.1000	-.0172	1.4500	-.2499
.1250	-.0189	1.8125	-.2746
.1500	-.0204	2.1750	-.2964
.1750	-.0218	2.5375	-.3159
.2000	-.0230	2.9000	-.3331
.2250	-.0240	3.2625	-.3481
.2500	-.0249	3.6250	-.3612
.2750	-.0257	3.9875	-.3725
.3000	-.0263	4.3500	-.3820
.3250	-.0269	4.7125	-.3900
.3500	-.0273	5.0750	-.3964
.3750	-.0277	5.4375	-.4014
.4000	-.0279	5.8000	-.4049
.4250	-.0281	6.1625	-.4070
.4500	-.0281	6.5250	-.4077
.4750	-.0281	6.8875	-.4071
.5000	-.0279	7.2500	-.4052
.5250	-.0277	7.6126	-.4020
.5500	-.0274	7.9751	-.3974
.5750	-.0270	8.3376	-.3915
.6000	-.0265	8.7001	-.3843
.6250	-.0259	9.0626	-.3758
.6500	-.0252	9.4251	-.3659
.6750	-.0245	9.7876	-.3546
.7000	-.0236	10.1501	-.3418
.7250	-.0226	10.5126	-.3276

.7500	-.0215	10.8751	-.3117
.7750	-.0203	11.2376	-.2942
.8000	-.0190	11.6001	-.2751
.8250	-.0175	11.9626	-.2539
.8500	-.0159	12.3251	-.2303
.8750	-.0141	12.6876	-.2042
.9000	-.0122	13.0501	-.1764
.9250	-.0101	13.4126	-.1458
.9500	-.0074	13.7751	-.1074
.9750	-.0039	14.1376	-.0571
1.0000	0.0000	14.5001	0.0000

Y= -47.5539 Y/B/2= -.6652 CHORD= 15.9195

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0982 .0696 .0515 .0378 .0265 .0167 .0078-.0005-.0085-.0163-.0242-.0323-.0409-.0504-.0616-.0759-.0977-.1578

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0107	0.0000	-.1711
.0250	-.0132	.3980	-.2105
.0500	-.0157	.7960	-.2496
.0750	-.0179	1.1940	-.2853
.1000	-.0198	1.5919	-.3152
.1250	-.0214	1.9899	-.3403
.1500	-.0228	2.3879	-.3623
.1750	-.0240	2.7859	-.3818
.2000	-.0251	3.1839	-.3988
.2250	-.0260	3.5819	-.4135
.2500	-.0268	3.9799	-.4261
.2750	-.0274	4.3779	-.4368
.3000	-.0280	4.7758	-.4456
.3250	-.0284	5.1738	-.4527
.3500	-.0288	5.5718	-.4582
.3750	-.0290	5.9698	-.4620
.4000	-.0292	6.3678	-.4644
.4250	-.0292	6.7658	-.4652
.4500	-.0292	7.1638	-.4646
.4750	-.0291	7.5618	-.4626
.5000	-.0288	7.9597	-.4591
.5250	-.0285	8.3577	-.4542
.5500	-.0281	8.7557	-.4480
.5750	-.0277	9.1537	-.4403
.6000	-.0271	9.5517	-.4312
.6250	-.0264	9.9497	-.4207
.6500	-.0257	10.3477	-.4088
.6750	-.0248	10.7457	-.3953
.7000	-.0239	11.1436	-.3804
.7250	-.0229	11.5416	-.3638

.7500	-.0217	11.9396	-.3455
.7750	-.0205	12.3376	-.3256
.8000	-.0191	12.7356	-.3038
.8250	-.0176	13.1336	-.2799
.8500	-.0159	13.5316	-.2534
.8750	-.0141	13.9296	-.2243
.9000	-.0121	14.3275	-.1933
.9250	-.0100	14.7255	-.1594
.9500	-.0074	15.1235	-.1172
.9750	-.0039	15.5215	-.0622
1.0000	0.0000	15.9195	0.0000

Y= -43.5928 Y/B/2= -.6098 CHORD= 17.3389

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0922 .0643 .0467 .0333 .0223 .0128 .0041-.0039-.0116-.0192-.0268-.0346-.0429-.0521-.0628-.0765-.0976-.1560

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0136	0.0000	-.2364
.0250	-.0160	.4335	-.2768
.0500	-.0183	.8669	-.3168
.0750	-.0204	1.3004	-.3531
.1000	-.0221	1.7339	-.3834
.1250	-.0236	2.1674	-.4085
.1500	-.0248	2.6008	-.4303
.1750	-.0259	3.0343	-.4495
.2000	-.0269	3.4678	-.4661
.2250	-.0277	3.9013	-.4802
.2500	-.0284	4.3347	-.4920
.2750	-.0289	4.7682	-.5018
.3000	-.0294	5.2017	-.5097
.3250	-.0297	5.6351	-.5157
.3500	-.0300	6.0686	-.5200
.3750	-.0301	6.5021	-.5226
.4000	-.0302	6.9356	-.5236
.4250	-.0302	7.3690	-.5230
.4500	-.0300	7.8025	-.5209
.4750	-.0298	8.2360	-.5172
.5000	-.0295	8.6694	-.5121
.5250	-.0292	9.1029	-.5055
.5500	-.0287	9.5364	-.4974
.5750	-.0281	9.9699	-.4879
.6000	-.0275	10.4033	-.4768
.6250	-.0268	10.8368	-.4643
.6500	-.0260	11.2703	-.4503
.6750	-.0251	11.7038	-.4347
.7000	-.0241	12.1372	-.4175
.7250	-.0230	12.5707	-.3986

.7500	-.0218	13.0042	-.3780
.7750	-.0205	13.4376	-.3555
.8000	-.0191	13.8711	-.3312
.8250	-.0176	14.3046	-.3046
.8500	-.0159	14.7381	-.2753
.8750	-.0140	15.1715	-.2433
.9000	-.0121	15.6050	-.2093
.9250	-.0099	16.0385	-.1722
.9500	-.0073	16.4720	-.1263
.9750	-.0039	16.9054	-.0670
1.0000	0.0000	17.3389	0.0000

Y= -39.6316 Y/B/2= -.5544 CHORD= 18.7583

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0861 .0590 .0418 .0289 .0182 .0089 .0006-.0072-.0146-.0219-.0291-.0366-.0446-.0533-.0636-.0768-.0971-.1535

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0164	0.0000	-.3068
.0250	-.0185	.4690	-.3476
.0500	-.0207	.9379	-.3880
.0750	-.0226	1.4069	-.4246
.1000	-.0242	1.8758	-.4547
.1250	-.0256	2.3448	-.4795
.1500	-.0267	2.8137	-.5008
.1750	-.0277	3.2827	-.5193
.2000	-.0285	3.7517	-.5351
.2250	-.0292	4.2206	-.5482
.2500	-.0298	4.6896	-.5590
.2750	-.0303	5.1585	-.5677
.3000	-.0306	5.6275	-.5743
.3250	-.0309	6.0964	-.5790
.3500	-.0310	6.5654	-.5819
.3750	-.0311	7.0344	-.5830
.4000	-.0310	7.5033	-.5824
.4250	-.0309	7.9723	-.5802
.4500	-.0307	8.4412	-.5764
.4750	-.0304	8.9102	-.5710
.5000	-.0301	9.3791	-.5640
.5250	-.0296	9.8481	-.5556
.5500	-.0291	10.3171	-.5456
.5750	-.0285	10.7860	-.5340
.6000	-.0278	11.2550	-.5210
.6250	-.0270	11.7239	-.5063
.6500	-.0261	12.1929	-.4901
.6750	-.0252	12.6618	-.4723
.7000	-.0241	13.1308	-.4529
.7250	-.0230	13.5998	-.4317

.7500	-.0218	14.0687	-.4086
.7750	-.0205	14.5377	-.3837
.8000	-.0190	15.0066	-.3569
.8250	-.0175	15.4756	-.3278
.8500	-.0158	15.9446	-.2958
.8750	-.0139	16.4135	-.2609
.9000	-.0119	16.8825	-.2240
.9250	-.0098	17.3514	-.1840
.9500	-.0072	17.8204	-.1347
.9750	-.0038	18.2893	-.0713
1.0000	0.0000	18.7583	0.0000

Y= -35.6705 Y/B/2= -.4990 CHORD= 20.1777

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0797 .0534 .0367 .0241 .0137 .0047-.0034-.0109-.0181-.0250-.0320-.0391-.0467-.0550-.0648-.0774-.0968-.1512

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0194	0.0000	-.3919
.0250	-.0214	.5044	-.4325
.0500	-.0234	1.0089	-.4728
.0750	-.0252	1.5133	-.5091
.1000	-.0267	2.0178	-.5386
.1250	-.0279	2.5222	-.5625
.1500	-.0289	3.0267	-.5827
.1750	-.0297	3.5311	-.6001
.2000	-.0305	4.0355	-.6146
.2250	-.0310	4.5400	-.6263
.2500	-.0315	5.0444	-.6356
.2750	-.0318	5.5489	-.6427
.3000	-.0321	6.0533	-.6476
.3250	-.0322	6.5578	-.6505
.3500	-.0323	7.0622	-.6515
.3750	-.0322	7.5666	-.6507
.4000	-.0321	8.0711	-.6481
.4250	-.0319	8.5755	-.6438
.4500	-.0316	9.0800	-.6378
.4750	-.0312	9.5844	-.6302
.5000	-.0308	10.0888	-.6210
.5250	-.0302	10.5933	-.6102
.5500	-.0296	11.0977	-.5979
.5750	-.0289	11.6022	-.5839
.6000	-.0282	12.1066	-.5684
.6250	-.0273	12.6111	-.5513
.6500	-.0264	13.1155	-.5326
.6750	-.0254	13.6199	-.5122
.7000	-.0243	14.1244	-.4901
.7250	-.0231	14.6288	-.4663

.7500	-.0218	15.1333	-.4406
.7750	-.0205	15.6377	-.4129
.8000	-.0190	16.1422	-.3833
.8250	-.0174	16.6466	-.3514
.8500	-.0157	17.1510	-.3165
.8750	-.0138	17.6555	-.2786
.9000	-.0118	18.1599	-.2387
.9250	-.0097	18.6644	-.1956
.9500	-.0071	19.1688	-.1429
.9750	-.0037	19.6733	-.0756
1.0000	0.0000	20.1777	0.0000

Y= -31.7094 Y/B/2= -.4435 CHORD= 21.5971

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0728 .0472 .0308 .0185 .0082-.0006-.0086-.0160-.0230-.0298-.0365-.0433-.0505-.0583-.0675-.0792-.0975-.1497

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0237	0.0000	-.5121
.0250	-.0256	.5399	-.5519
.0500	-.0274	1.0799	-.5913
.0750	-.0290	1.6198	-.6265
.1000	-.0303	2.1597	-.6546
.1250	-.0313	2.6996	-.6769
.1500	-.0322	3.2396	-.6954
.1750	-.0329	3.7795	-.7109
.2000	-.0335	4.3194	-.7233
.2250	-.0339	4.8593	-.7328
.2500	-.0343	5.3993	-.7398
.2750	-.0345	5.9392	-.7443
.3000	-.0346	6.4791	-.7467
.3250	-.0346	7.0191	-.7469
.3500	-.0345	7.5590	-.7451
.3750	-.0343	8.0989	-.7414
.4000	-.0341	8.6388	-.7359
.4250	-.0337	9.1788	-.7285
.4500	-.0333	9.7187	-.7194
.4750	-.0328	10.2586	-.7086
.5000	-.0322	10.7985	-.6960
.5250	-.0316	11.3385	-.6819
.5500	-.0308	11.8784	-.6661
.5750	-.0300	12.4183	-.6486
.6000	-.0292	12.9583	-.6296
.6250	-.0282	13.4982	-.6088
.6500	-.0272	14.0381	-.5865
.6750	-.0260	14.5780	-.5624
.7000	-.0248	15.1180	-.5366
.7250	-.0236	15.6579	-.5091

.7500	-.0222	16.1978	-.4796
.7750	-.0208	16.7377	-.4482
.8000	-.0192	17.2777	-.4148
.8250	-.0176	17.8176	-.3791
.8500	-.0158	18.3575	-.3405
.8750	-.0138	18.8975	-.2989
.9000	-.0118	19.4374	-.2552
.9250	-.0096	19.9773	-.2083
.9500	-.0070	20.5172	-.1517
.9750	-.0037	21.0572	-.0801
1.0000	0.0000	21.5971	0.0000

Y= -28.7324 Y/B/2= -.4019 CHORD= 22.6638

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0674 .0419 .0255 .0129 .0025-.0066-.0149-.0225-.0298-.0368-.0437-.0507-.0579-.0656-.0744-.0852-.1015-.1495

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0297	0.0000	-.6727
.0250	-.0314	.5666	-.7113
.0500	-.0331	1.1332	-.7495
.0750	-.0346	1.6998	-.7834
.1000	-.0357	2.2664	-.8100
.1250	-.0366	2.8330	-.8304
.1500	-.0374	3.3996	-.8468
.1750	-.0379	3.9662	-.8600
.2000	-.0384	4.5328	-.8699
.2250	-.0387	5.0994	-.8767
.2500	-.0389	5.6660	-.8808
.2750	-.0389	6.2326	-.8823
.3000	-.0389	6.7992	-.8815
.3250	-.0388	7.3658	-.8784
.3500	-.0385	7.9323	-.8730
.3750	-.0382	8.4989	-.8656
.4000	-.0378	9.0655	-.8562
.4250	-.0373	9.6321	-.8448
.4500	-.0367	10.1987	-.8315
.4750	-.0360	10.7653	-.8164
.5000	-.0353	11.3319	-.7994
.5250	-.0344	11.8985	-.7806
.5500	-.0335	12.4651	-.7601
.5750	-.0326	13.0317	-.7378
.6000	-.0315	13.5983	-.7137
.6250	-.0303	14.1649	-.6878
.6500	-.0291	14.7315	-.6602
.6750	-.0278	15.2981	-.6308
.7000	-.0265	15.8647	-.5996
.7250	-.0250	16.4313	-.5664

.7500	-.0234	16.9979	-.5313
.7750	-.0218	17.5645	-.4943
.8000	-.0201	18.1311	-.4552
.8250	-.0183	18.6977	-.4137
.8500	-.0163	19.2643	-.3694
.8750	-.0142	19.8309	-.3222
.9000	-.0121	20.3975	-.2732
.9250	-.0098	20.9641	-.2212
.9500	-.0071	21.5307	-.1598
.9750	-.0037	22.0973	-.0840
1.0000	0.0000	22.6638	0.0000

Y= -25.7554 Y/B/2= -.3603 CHORD= 24.2323

SLOPES, DZ/DX, AT SLOPE POINTS, FROM FRONT TO REAR

.0602 .0360 .0206 .0089-.0006-.0089-.0163-.0231-.0295-.0357-.0418-.0479-.0542-.0610-.0687-.0784-.0928-.1333

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0288	0.0000	-.6972
.0250	-.0303	.6058	-.7341
.0500	-.0318	1.2116	-.7706
.0750	-.0331	1.8174	-.8028
.1000	-.0341	2.4232	-.8274
.1250	-.0349	3.0290	-.8458
.1500	-.0355	3.6349	-.8602
.1750	-.0360	4.2407	-.8715
.2000	-.0363	4.8465	-.8794
.2250	-.0365	5.4523	-.8844
.2500	-.0366	6.0581	-.8866
.2750	-.0366	6.6639	-.8863
.3000	-.0365	7.2697	-.8838
.3250	-.0363	7.8755	-.8790
.3500	-.0360	8.4813	-.8721
.3750	-.0356	9.0871	-.8632
.4000	-.0352	9.6929	-.8523
.4250	-.0346	10.2987	-.8396
.4500	-.0341	10.9046	-.8251
.4750	-.0334	11.5104	-.8088
.5000	-.0326	12.1162	-.7909
.5250	-.0318	12.7220	-.7712
.5500	-.0309	13.3278	-.7498
.5750	-.0300	13.9336	-.7268
.6000	-.0290	14.5394	-.7021
.6250	-.0279	15.1452	-.6758
.6500	-.0267	15.7510	-.6478
.6750	-.0255	16.3568	-.6182
.7000	-.0242	16.9626	-.5868
.7250	-.0228	17.5684	-.5536

.7500	-.0214	18.1743	-.5186
.7750	-.0199	18.7801	-.4818
.8000	-.0183	19.3859	-.4430
.8250	-.0166	19.9917	-.4021
.8500	-.0148	20.5975	-.3584
.8750	-.0129	21.2033	-.3120
.9000	-.0109	21.8091	-.2637
.9250	-.0088	22.4149	-.2125
.9500	-.0063	23.0207	-.1528
.9750	-.0033	23.6265	-.0801
1.0000	0.0000	24.2323	0.0000

Y= -21.7943 Y/B/2= -.3049 CHORD= 26.6552

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0527 .0302 .0159 .0053-.0034-.0108-.0174-.0234-.0290-.0344-.0397-.0450-.0505-.0564-.0633-.0720-.0854-.1233

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
.0000	-.0281	.0000	-.7486
.0250	-.0294	.6664	-.7841
.0500	-.0307	1.3328	-.8193
.0750	-.0319	1.9991	-.8500
.1000	-.0328	2.6655	-.8730
.1250	-.0334	3.3319	-.8897
.1500	-.0339	3.9983	-.9023
.1750	-.0342	4.6647	-.9117
.2000	-.0344	5.3310	-.9178
.2250	-.0345	5.9974	-.9208
.2500	-.0346	6.6638	-.9211
.2750	-.0345	7.3302	-.9190
.3000	-.0343	7.9966	-.9146
.3250	-.0341	8.6629	-.9080
.3500	-.0337	9.3293	-.8993
.3750	-.0333	9.9957	-.8886
.4000	-.0329	10.6621	-.8761
.4250	-.0323	11.3285	-.8618
.4500	-.0317	11.9949	-.8457
.4750	-.0311	12.6612	-.8279
.5000	-.0303	13.3276	-.8085
.5250	-.0295	13.9940	-.7874
.5500	-.0287	14.6604	-.7648
.5750	-.0278	15.3268	-.7405
.6000	-.0268	15.9931	-.7147
.6250	-.0258	16.6595	-.6873
.6500	-.0247	17.3259	-.6584
.6750	-.0236	17.9923	-.6278
.7000	-.0223	18.6587	-.5956
.7250	-.0211	19.3250	-.5616

.7500	-.0197	19.9914	-.5259
.7750	-.0183	20.6578	-.4884
.8000	-.0168	21.3242	-.4491
.8250	-.0153	21.9906	-.4076
.8500	-.0136	22.6569	-.3634
.8750	-.0119	23.3233	-.3164
.9000	-.0100	23.9897	-.2677
.9250	-.0081	24.6561	-.2159
.9500	-.0058	25.3225	-.1555
.9750	-.0031	25.9888	-.0815
1.0000	0.0000	26.6552	0.0000

Y= -17.8332 Y/B/2= -.2494 CHORD= 29.0781

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0454 .0243 .0110 .0010-.0070-.0139-.0199-.0254-.0305-.0353-.0401-.0448-.0498-.0551-.0614-.0693-.0817-.1170

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0294	0.0000	-.8539
.0250	-.0305	.7270	-.8873
.0500	-.0317	1.4539	-.9203
.0750	-.0326	2.1809	-.9488
.1000	-.0333	2.9078	-.9694
.1250	-.0338	3.6348	-.9836
.1500	-.0342	4.3617	-.9936
.1750	-.0344	5.0887	-1.0003
.2000	-.0345	5.8156	-1.0037
.2250	-.0345	6.5426	-1.0040
.2500	-.0344	7.2695	-1.0015
.2750	-.0343	7.9965	-.9966
.3000	-.0340	8.7234	-.9893
.3250	-.0337	9.4504	-.9798
.3500	-.0333	10.1773	-.9682
.3750	-.0328	10.9043	-.9547
.4000	-.0323	11.6312	-.9393
.4250	-.0317	12.3582	-.9220
.4500	-.0311	13.0851	-.9031
.4750	-.0303	13.8121	-.8825
.5000	-.0296	14.5391	-.8602
.5250	-.0288	15.2660	-.8364
.5500	-.0279	15.9930	-.8109
.5750	-.0270	16.7199	-.7839
.6000	-.0260	17.4469	-.7554
.6250	-.0249	18.1738	-.7253
.6500	-.0239	18.9008	-.6937
.6750	-.0227	19.6277	-.6605
.7000	-.0215	20.3547	-.6257
.7250	-.0203	21.0816	-.5892

.7500	-.0190	21.8086	-.5510
.7750	-.0176	22.5355	-.5111
.8000	-.0161	23.2625	-.4693
.8250	-.0146	23.9894	-.4253
.8500	-.0130	24.7164	-.3787
.8750	-.0113	25.4433	-.3293
.9000	-.0096	26.1703	-.2782
.9250	-.0077	26.8973	-.2240
.9500	-.0055	27.6242	-.1610
.9750	-.0029	28.3512	-.0844
1.0000	0.0000	29.0781	0.0000

Y= -13.8721 Y/B/2= -.1940 CHORD= 31.5010

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0379 .0180 .0055-.0039-.0114-.0178-.0234-.0285-.0331-.0375-.0418-.0461-.0505-.0553-.0609-.0682-.0795-.1123

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0317	0.0000	-.9994
.0250	-.0327	.7875	-1.0297
.0500	-.0336	1.5750	-1.0595
.0750	-.0344	2.3626	-1.0847
.1000	-.0350	3.1501	-1.1019
.1250	-.0353	3.9376	-1.1125
.1500	-.0355	4.7251	-1.1189
.1750	-.0356	5.5127	-1.1219
.2000	-.0356	6.3002	-1.1216
.2250	-.0355	7.0877	-1.1180
.2500	-.0353	7.8752	-1.1117
.2750	-.0350	8.6628	-1.1028
.3000	-.0347	9.4503	-1.0916
.3250	-.0342	10.2378	-1.0781
.3500	-.0337	11.0253	-1.0626
.3750	-.0332	11.8129	-1.0451
.4000	-.0326	12.6004	-1.0257
.4250	-.0319	13.3879	-1.0045
.4500	-.0312	14.1754	-.9816
.4750	-.0304	14.9630	-.9570
.5000	-.0295	15.7505	-.9308
.5250	-.0287	16.5380	-.9031
.5500	-.0277	17.3255	-.8738
.5750	-.0268	18.1131	-.8430
.6000	-.0257	18.9006	-.8106
.6250	-.0247	19.6881	-.7768
.6500	-.0235	20.4756	-.7415
.6750	-.0224	21.2632	-.7046
.7000	-.0211	22.0507	-.6662
.7250	-.0199	22.8382	-.6261

.7500	-.0186	23.6257	-.5844
.7750	-.0172	24.4133	-.5410
.8000	-.0157	25.2008	-.4957
.8250	-.0142	25.9883	-.4484
.8500	-.0126	26.7758	-.3985
.8750	-.0110	27.5634	-.3458
.9000	-.0093	28.3509	-.2914
.9250	-.0074	29.1384	-.2341
.9500	-.0053	29.9259	-.1678
.9750	-.0028	30.7135	-.0878
1.0000	0.0000	31.5010	0.0000

Y= -9.9110 Y/B/2= -.1386 CHORD= 33.9239

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0295 .0106-.0013-.0102-.0173-.0233-.0285-.0331-.0373-.0412-.0450-.0488-.0526-.0568-.0617-.0682-.0785-.1089

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
0.0000	-.0354	0.0000	-1.2019
.0250	-.0362	.8481	-1.2274
.0500	-.0369	1.6962	-1.2525
.0750	-.0375	2.5443	-1.2727
.1000	-.0379	3.3924	-1.2848
.1250	-.0380	4.2405	-1.2901
.1500	-.0381	5.0886	-1.2911
.1750	-.0380	5.9367	-1.2887
.2000	-.0378	6.7848	-1.2828
.2250	-.0375	7.6329	-1.2736
.2500	-.0372	8.4810	-1.2616
.2750	-.0368	9.3291	-1.2471
.3000	-.0363	10.1772	-1.2301
.3250	-.0357	11.0253	-1.2110
.3500	-.0351	11.8734	-1.1897
.3750	-.0344	12.7215	-1.1665
.4000	-.0336	13.5696	-1.1414
.4250	-.0329	14.4176	-1.1146
.4500	-.0320	15.2657	-1.0861
.4750	-.0311	16.1138	-1.0559
.5000	-.0302	16.9619	-1.0242
.5250	-.0292	17.8100	-.9909
.5500	-.0282	18.6581	-.9562
.5750	-.0271	19.5062	-.9200
.6000	-.0260	20.3543	-.8824
.6250	-.0249	21.2024	-.8433
.6500	-.0237	22.0505	-.8029
.6750	-.0224	22.8986	-.7610
.7000	-.0212	23.7467	-.7176
.7250	-.0198	24.5948	-.6727

.7500	-.0185	25.4429	-.6262
.7750	-.0170	26.2910	-.5781
.8000	-.0156	27.1391	-.5284
.8250	-.0141	27.9872	-.4767
.8500	-.0125	28.8353	-.4224
.8750	-.0108	29.6834	-.3656
.9000	-.0091	30.5315	-.3070
.9250	-.0072	31.3796	-.2457
.9500	-.0052	32.2277	-.1756
.9750	-.0027	33.0758	-.0917
1.0000	0.0000	33.9239	0.0000

Y= -5.9499 Y/B/2= -.0832 CHORD= 36.3468

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

.0184 .0001-.0115-.0200-.0268-.0323-.0371-.0412-.0449-.0482-.0514-.0544-.0576-.0610-.0650-.0703-.0793-.1070

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
.0000	-.0421	.0000	-1.5300
.0250	-.0426	.9087	-1.5472
.0500	-.0430	1.8173	-1.5640
.0750	-.0434	2.7260	-1.5758
.1000	-.0434	3.6347	-1.5791
.1250	-.0433	4.5433	-1.5754
.1500	-.0431	5.4520	-1.5671
.1750	-.0428	6.3607	-1.5553
.2000	-.0424	7.2694	-1.5399
.2250	-.0419	8.1780	-1.5212
.2500	-.0413	9.0867	-1.4996
.2750	-.0406	9.9954	-1.4755
.3000	-.0399	10.9040	-1.4489
.3250	-.0391	11.8127	-1.4201
.3500	-.0382	12.7214	-1.3892
.3750	-.0373	13.6300	-1.3565
.4000	-.0364	14.5387	-1.3219
.4250	-.0354	15.4474	-1.2856
.4500	-.0343	16.3560	-1.2478
.4750	-.0332	17.2647	-1.2084
.5000	-.0321	18.1734	-1.1676
.5250	-.0310	19.0820	-1.1253
.5500	-.0298	19.9907	-1.0817
.5750	-.0285	20.8994	-1.0368
.6000	-.0273	21.8081	-.9907
.6250	-.0260	22.7167	-.9432
.6500	-.0246	23.6254	-.8946
.6750	-.0232	24.5341	-.8446
.7000	-.0218	25.4427	-.7934
.7250	-.0204	26.3514	-.7409

.7500	-.0189	27.2601	-.6870
.7750	-.0174	28.1687	-.6317
.8000	-.0158	29.0774	-.5749
.8250	-.0142	29.9861	-.5164
.8500	-.0125	30.8947	-.4557
.8750	-.0108	31.8034	-.3926
.9000	-.0090	32.7121	-.3281
.9250	-.0072	33.6208	-.2611
.9500	-.0051	34.5294	-.1656
.9750	-.0027	35.4381	-.0966
1.0000	0.0000	36.3468	0.0000

Y= -1.9847 Y/B/2= -.0278 CHORD= 38.7722

SLOPES,DZ/DX,AT SLOPE POINTS,FROM FRONT TO REAR

-.0047-.0239-.0357-.0439-.0501-.0549-.0587-.0617-.0642-.0662-.0680-.0696-.0713-.0730-.0753-.0787-.0850-.1081

CORRESPONDING X/C LOCATIONS FROM FRONT TO REAR

.0417 .0972 .1528 .2083 .2639 .3194 .3750 .4306 .4861 .5417 .5972 .6528 .7083 .7639 .8194 .8750 .9306 .9861

LOCAL ELEVATION

X/C	Z/C	DELTA X	DELTA Z
.0000	-.0593	.0000	-2.2982
.0250	-.0592	.9693	-2.2942
.0500	-.0591	1.9386	-2.2897
.0750	-.0588	2.9079	-2.2796
.1000	-.0583	3.8772	-2.2600
.1250	-.0576	4.8465	-2.2327
.1500	-.0568	5.8158	-2.2005
.1750	-.0558	6.7851	-2.1645
.2000	-.0548	7.7544	-2.1248
.2250	-.0537	8.7237	-2.0817
.2500	-.0525	9.6930	-2.0357
.2750	-.0513	10.6623	-1.9873
.3000	-.0499	11.6316	-1.9366
.3250	-.0486	12.6009	-1.8839
.3500	-.0472	13.5703	-1.8294
.3750	-.0457	14.5396	-1.7733
.4000	-.0443	15.5089	-1.7158
.4250	-.0427	16.4782	-1.6569
.4500	-.0412	17.4475	-1.5967
.4750	-.0396	18.4168	-1.5355
.5000	-.0380	19.3861	-1.4733
.5250	-.0364	20.3554	-1.4101
.5500	-.0347	21.3247	-1.3460
.5750	-.0330	22.2940	-1.2811
.6000	-.0314	23.2633	-1.2155
.6250	-.0296	24.2326	-1.1491
.6500	-.0279	25.2019	-1.0821
.6750	-.0262	26.1712	-1.0143
.7000	-.0244	27.1405	-.9458
.7250	-.0226	28.1098	-.8766

.7500	-.0208	29.0791	-.8067
.7750	-.0190	30.0484	-.7359
.8000	-.0171	31.0177	-.6644
.8250	-.0153	31.9870	-.5917
.8500	-.0133	32.9563	-.5175
.8750	-.0114	33.9256	-.4418
.9000	-.0094	34.8949	-.3653
.9250	-.0074	35.8642	-.2871
.9500	-.0052	36.8335	-.2016
.9750	-.0027	37.8028	-.1042
1.0000	0.0000	38.7722	0.0000

APPENDIX B

DETAILS OF DATA PREPARATION FOR NUMERICALLY CONTROLLED MACHINING OF WING-WINGLET MODELS

```
      PROGRAM TX23Z(INPUT,OUTPUT,TAPE5,TAPE6=OUTPUT,TAPE10)
C
C     PROGRAM WRITTEN BY J KUHLMAN FOR PREPARING AIRFOIL
C     COORDINATES, IN INCHES, FOR WING WITH WINGLET
C     MODEL TO BE TESTED IN 7X10 FOOT TUNNEL.
C     DESIGNED USING TN D-8090 DESIGN CODE BY LAMAR OR
C     MODIFIED VERSION OF THIS CODE USING TREFFTZ
C     PLANE WAKE MODEL OF CR-3154 BY KUHLMAN.
C
C     NAMELIST DATA INPUT INCLUDES CAMBERS (Z/C) FROM
C     DESIGN CODES AT 21 SPAN STATIONS (PCTY HEREIN)
C     AND 30 X/C STATIONS (PCTX HEREIN), AS WELL
C     AS CHORD VALUES FOR WING, IN INCHES. THESE DATA
C     SETS ARE STORRED ON PERMANENT FILES ZOCJK AND ZCCOR.
C
C     TOC ARRAY IS SEMI-THICKNESS/C FOR NACA 64A008
C     BASIC THICKNESS FORM.
C
C     SINCH IS DISTANCE IN PLANE OF WING OR WINGLET
C     MEASURED FROM ROOT.
C
C     LINEAR INTERPOLATION OR EXTRAPOLATION IN SPAN
C     DIRECTION USING IUNI PERFORMED TO GENERATE ZS AT ROOT,
C     TE BREAK, JCT OF WING AND WINGLET, LE BREAK ON
C     WINGLET, AND WINGLET TIP.
C
C     THE Z/C TABLE IS SCALED BY THE LOCAL CHORD VALUE
C     TIMES COSINE OF THE LOCAL DIHEDRAL ANGLE, SINCE
C     WING AND WINGLET ARE TO BE MACHINED SEPARATELY.
C
C     THE YOB,CORD VALUES ARE THE INTERPOLATION STATIONS.
C
C     PCTX,YUP,YLO, ARE WRITTEN ON TAPE10 WHICH MAY
C     THEN BE DISPOSED TO THE KEYPUNCH, TO OBTAIN
C     PUNCHED INPUT CARDS FORMATTED FOR USE BY THE TX23
C     NUMERICAL CONTROL MACHINE.
C
C     INFOPLT PLOTS ZUP AND ZLO (UPPER AND LOWER SUR-
C     FACE AIRFOIL COORDINATES) OVER CHORDS, VS PCTX.
C
      DIMENSION CAMBER(30,21),PCTY(21),YOB(5),CHORD(21)
      DIMENSION PCTX(30),CORD(5)
```

Listing of Computer Program for Rescaling of Geometry

```
      DIMENSION ZTERP(30,6),PCTW(18),PCTT(3)
      DIMENSION TOC(30)
      DIMENSION CAM(21),ZUP(30),ZLO(30),ZUPC(30),ZLOC(30)
      NAMELIST/DATA/CAMBER,CHORD
      READ(5,DATA)
      IF(EOF(5)) 10,20
   10 WRITE(6,11)
   11 FORMAT(/10X,13HNO DATA FOUND)
      STOP
   20 CONTINUE
      REWIND 10
      CALL PSEUDO
C     CAMBER TABLES MUST BE INCREASING INDICES AS MOVE AFT AND AS MOVE
C     OUTBOARD IN SPANWISE DIRECTION
      TOC(1)=0.0
      TOC(2)=1.353
      TOC(3)=1.863
      TOC(4)=2.245
      TOC(5)=2.559
      TOC(6)=2.830
      TOC(7)=3.047
      TOC(8)=3.233
      TOC(9)=3.414
      TOC(10)=3.556
      TOC(11)=3.681
      TOC(12)=3.781
      TOC(13)=3.866
      TOC(14)=3.929
      TOC(15)=3.972
      TOC(16)=3.990
      TOC(17)=3.998
      TOC(18)=3.972
      TOC(19)=3.921
      TOC(20)=3.757
      TOC(21)=3.524
      TOC(22)=3.234
      TOC(23)=2.897
      TOC(24)=2.521
      TOC(25)=2.117
      TOC(26)=1.698
      TOC(27)=1.278
      TOC(28)=0.858
```

```
      TOC(29)=0.438
      TOC(30)=0.018
      RAD=4.*ATAN(1.)/180.
      ANG1=6.*RAD
      ANG2=77.5*RAD
      WRITE(6,12) ANG1,ANG2
   12 FORMAT(/20X,3F12.5/)
      PCTY(1)=0.0278
      PCTY(2)=0.0832
      PCTY(3)=0.1386
      PCTY(4)=0.1940
      PCTY(5)=0.2494
      PCTY(6)=0.3049
      PCTY(7)=0.3603
      PCTY(8)=0.4019
      PCTY(9)=0.4435
      PCTY(10)=0.4990
      PCTY(11)=0.5544
      PCTY(12)=0.6098
      PCTY(13)=0.6652
      PCTY(14)=0.7206
      PCTY(15)=0.7760
      PCTY(16)=0.8314
      PCTY(17)=0.8868
      PCTY(18)=0.9422
      PCTY(19)=0.9737
      PCTY(20)=0.9827
      PCTY(21)=0.9940
      YM=28.1459
      YOB(1)=0.
      YOB(2)=10.9197/YM
      YOB(3)=27.2992/YM
      YOB(4)=27.5109/YM
      YOB(5)=1.0
      CORD(1)=15.7426
      CORD(2)=9.0633
      CORD(3)=3.194
      CORD(4)=1.73
      CORD(5)=0.6916
      DO 1 I=1,19
    1 PCTX(I)=0.025*FLOAT(I-1)*100.
      DO 2 I=20,30
```

```
      PCTX(I)=0.05*FLOAT(I)-0.50
    2 PCTX(I)=PCTX(I)*100.
      ANG=ANG1
      DO 30 I=1,21
      IF(I.GE.19) ANG=ANG2
      DO 22 J=1,30
      CAMBER(J,I)=CAMBER(J,I)*COS(ANG)*CHORD(I)
      THK=CHORD(I)*TOC(J)/100.
      IF(J.EQ.1) GO TO 77
      IF(THK.LT.0.01) THK=0.01
   77 CONTINUE
C     ASK HOW THIN THE TRAILING EDGE CAN BE
      ZUP(J)=CAMBER(J,I)+THK
      ZLO(J)=ZUP(J)-2.*THK
      ZUPC(J)=ZUP(J)/CHORD(I)+0.5
      ZLOC(J)=ZLO(J)/CHORD(I)+0.5
   22 CONTINUE
      XI=FLOAT(I)
      SINCH=28.1459*PCTY(I)/COS(ANG1)
      IF(I.GE.19) SINCH=130.043125*PCTY(I)-126.131098
      WRITE(10,120) XI,SINCH
  120 FORMAT(7F10.6)
      WRITE(10,120) (PCTX(L),L=1,30)
      WRITE(10,120) (ZUP(L),L=1,30)
      WRITE(10,120) (ZLO(L),L=1,30)
      WRITE(6,129)
  129 FORMAT(1H1)
      WRITE(6,130) XI,SINCH
      WRITE(6,833) CHORD(I),PCTY(I)
  833 FORMAT(20X,6HCHORD=,F10.6,6HY/B/2=,F10.6/)
  130 FORMAT(20X,2HI=,F8.2,3X,8HS(INCH)=,F10.6/)
      CALL INFOPLT(0,30,PCTX,1,ZUPC,1,0.,1.,0.,1.,0.0,3.
     13HX/C,12,12HZ COS(PHI)/C,0)
      CALL INFOPLT(0,30,PCTX,1,ZLOC,1,0.,1.,0.,1.,0.0,3.
     13HX/C,12,12HZ COS(PHI)/C,0)
      THET=0.
      XL=5.5
      YL=8.
      HT=0.3
      CALL NOTATE(XL,YL,HT,6HCHORD=,THET,6)
      YL=7.
      CALL NOTATE(XL,YL,HT,6HY/B/2=,THET,6)
```

```
      XL=8.
      YL=8.
      CALL NUMBER(XL,YL,HT,CHORD(I),THET,3)
      YL=7.
      CALL NUMBER(XL,YL,HT,PCTY(I),THET,3)
      CALL INFOPLT(1,0)
      WRITE(6,135)
  135 FORMAT(/24X,1HI,6X,4HPCTX,6X,7HZUP(IN),4X,7HZLO(IN)/)
      WRITE(6,140) (L,PCTX(L),ZUP(L),ZLO(L),L=1,30)
  140 FORMAT(21X,I5,3F11.6)
   30 CONTINUE
      IPT=-1
      IORDER=1
      DO 4 J=1,3
      DO 3 I=1,30
      DO 14 L=1,18
      PCTW(L)=PCTY(L)
   14 CAM(L)=CAMBER(I,L)
      XO=YOB(J)
      IPT=-1
      CALL IUNI(18,18,PCTW,1,CAM,IORDER,XO,ZO,IPT,IERR)
      WRITE(6,100) IERR
      ZTERP(I,J)=ZO
    3 CONTINUE
    4 CONTINUE
      DO 5 I=1,3
      WRITE(6,101) YOB(I)
      WRITE(6,111) (PCTX(J),ZTERP(J,I),J=1,30)
    5 CONTINUE
      DO 6 I=1,3
      WRITE(10,110) (ZTERP(J,I),J=1,30)
    6 CONTINUE
      DO 8 J=3,5
      J1=J+1
      DO 7 I=1,30
      DO 31 L=1,3
      LP=18+L
      PCTT(L)=PCTY(LP)
   31 CAM(L)=CAMBER(I,LP)
      XO=YOB(J)
      IPT=-1
      IORDER=1
```

```
      CALL IUNI(18,3,PCTT,1,CAM,IORDER,XO,ZO,IPT,IERR)
      WRITE(6,100) IERR
      ZTERP(I,J1)=ZO
    7 CONTINUE
    8 CONTINUE
      DO 9 J=3,5
      J1=J+1
      WRITE(6,101) YOB(J)
      WRITE(6,111) (PCTX(I),ZTERP(I,J1),I=1,30)
    9 CONTINUE
C     ADD SCALING CODING HERE TO COMPUTE ZUP AND ZLO INTERP
      DO 909 J=1,3
      DO 908 I=1,30
      THK=CORD(J)*TOC(I)/100.
      IF(I.EQ.1) GO TO 967
      IF(THK.LT.0.01) THK=0.01
  967 CONTINUE
      ZUP(I)=ZTERP(I,J)+THK
      ZLO(I)=ZUP(I)-2.*THK
  908 CONTINUE
      WRITE(10,120) (PCTX(L),L=1,30)
      WRITE(10,120) (ZUP(L),L=1,30)
      WRITE(10,120) (ZLO(L),L=1,30)
      WRITE(6,129)
      WRITE(6,920)
      WRITE(6,833) CORD(J),YOB(J)
  901 FORMAT(/20X,6HY/B/2=,F15.5/)
      WRITE(6,135)
      WRITE(6,140) (L,PCTX(L),ZUP(L),ZLO(L),L=1,30)
  920 FORMAT(/25X,25HINTERP ZS ON WING (INCH) /)
  909 CONTINUE
      DO 919 J=3,5
      J1=J+1
      DO 918 I=1,30
      THK=CORD(J)*TOC(I)/100.
      IF(I.EQ.1) GO TO 977
      IF(THK.LT.0.01) THK=0.01
  977 CONTINUE
      ZUP(I)=ZTERP(I,J1)+THK
      ZLO(I)=ZUP(I)-2.*THK
  918 CONTINUE
      WRITE(10,120) (PCTX(L),L=1,30)
```

```
      WRITE(10,120) (ZUP(L),L=1,30)
      WRITE(10,120) (ZLO(L),L=1,30)
      WRITE(6,129)
      WRITE(6,921)
      WRITE(6,833) CORD(J),YOB(J)
      WRITE(6,135)
      WRITE(6,140) (L,PCTX(L),ZUP(L),ZLO(L),L=1,30)
  921 FORMAT(/25X,28HINTERP ZS ON WINGLET (INCH) /)
  919 CONTINUE
      END FILE 10
      REWIND 10
  100 FORMAT(20X,2I10)
  101 FORMAT(/7H Y/B/2=,F15.5//26X,3HXOC,10X,8HINTERP Z//)
  111 FORMAT(20X,2F15.5)
  110 FORMAT(10F7.5)
      END
```

I= 1.00 S(INCH)= .786766

CHORD= 15.264600Y/B/2= .027800

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.851330	.851330
2	2.500000	1.056410	.643350
3	5.000000	1.132631	.563872
4	7.500000	1.187220	.501839
5	10.000000	1.227910	.446668
6	12.500000	1.259126	.395150
7	15.000000	1.280283	.350058
8	17.500000	1.295299	.308289
9	20.000000	1.308178	.265911
10	22.500000	1.313844	.228226
11	25.000000	1.315845	.192065
12	27.500000	1.313112	.158803
13	30.000000	1.307265	.127006
14	32.500000	1.297313	.097821
15	35.000000	1.283640	.071020
16	37.500000	1.265551	.047436
17	40.000000	1.245394	.024837
18	42.500000	1.219557	.006937
19	45.000000	1.189457	-.007593
20	50.000000	1.118607	-.028375
21	55.000000	1.035852	-.039997
22	60.000000	.943213	-.044101
23	65.000000	.842337	-.042094
24	70.000000	.734507	-.035134
25	75.000000	.621346	-.024958
26	80.000000	.504767	-.013619
27	85.000000	.386381	-.003782
28	90.000000	.266029	.004088
29	95.000000	.141446	.007728
30	100.000000	.010000	-.010000

Output of Computer Program for Rescaling of Wing-Winglet Geometry

I= 2.00 S(INCH)= 2.354638

CHORD= 14.309800Y/B/2= .083200

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.564536	.564536
2	2.500000	.764623	.377400
3	5.000000	.843919	.310736
4	7.500000	.903030	.260520
5	10.000000	.949259	.216884
6	12.500000	.986706	.176772
7	15.000000	1.014749	.142710
8	17.500000	1.037020	.111748
9	20.000000	1.057253	.080180
10	22.500000	1.070669	.052956
11	25.000000	1.080571	.027083
12	27.500000	1.085937	.003830
13	30.000000	1.088273	-.018161
14	32.500000	1.086636	-.037828
15	35.000000	1.081373	-.055397
16	37.500000	1.071824	-.070098
17	40.000000	1.060180	-.084031
18	42.500000	1.043046	-.093725
19	45.000000	1.021743	-.100431
20	50.000000	.968609	-.106629
21	55.000000	.903546	-.105009
22	60.000000	.828402	-.097156
23	65.000000	.744680	-.084430
24	70.000000	.653542	-.067958
25	75.000000	.556460	-.049417
26	80.000000	.455181	-.030780
27	85.000000	.351105	-.014653
28	90.000000	.243985	-.001571
29	95.000000	.131297	.005943
30	100.000000	.010000	-.010000

I= 3.00 S(INCH)= 3.922510

CHORD= 13.355900Y/B/2= .138600

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.443664	.443664
2	2.500000	.633925	.272514
3	5.000000	.711442	.213802
4	7.500000	.770064	.170384
5	10.000000	.816571	.133016
6	12.500000	.854802	.098858
7	15.000000	.884207	.070298
8	17.500000	.908179	.044587
9	20.000000	.930201	.018261
10	22.500000	.945807	-.004065
11	25.000000	.958079	-.025182
12	27.500000	.966064	-.043909
13	30.000000	.971162	-.061517
14	32.500000	.972441	-.077016
15	35.000000	.970372	-.090620
16	37.500000	.964187	-.101614
17	40.000000	.955978	-.111960
18	42.500000	.942572	-.118421
19	45.000000	.925202	-.122168
20	50.000000	.880400	-.123162
21	55.000000	.824135	-.117189
22	60.000000	.758110	-.105750
23	65.000000	.683704	-.090137
24	70.000000	.601675	-.071430
25	75.000000	.514265	-.051224
26	80.000000	.422167	-.031399
27	85.000000	.326917	-.014460
28	90.000000	.228223	-.000964
29	95.000000	.127530	.006532
30	100.000000	.010000	-.010000

I= 4.00 S(INCH)= 5.490381

CHORD= 12.402000Y/B/2= .194000

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.368965	.368965
2	2.500000	.548121	.212523
3	5.000000	.622578	.160480
4	7.500000	.679399	.122550
5	10.000000	.724820	.090085
6	12.500000	.762431	.060478
7	15.000000	.791767	.035989
8	17.500000	.815995	.014082
9	20.000000	.838346	-.008462
10	22.500000	.854674	-.027357
11	25.000000	.867846	-.045189
12	27.500000	.876980	-.060859
13	30.000000	.883378	-.075545
14	32.500000	.886220	-.088330
15	35.000000	.885804	-.099411
16	37.500000	.881557	-.108123
17	40.000000	.875374	-.116290
18	42.500000	.864309	-.120906
19	45.000000	.849504	-.123060
20	50.000000	.810377	-.121509
21	55.000000	.760360	-.113733
22	60.000000	.701026	-.101135
23	65.000000	.633640	-.084932
24	70.000000	.559168	-.066141
25	75.000000	.478834	-.046267
26	80.000000	.394095	-.027077
27	85.000000	.306043	-.010952
28	90.000000	.214376	.001557
29	95.000000	.116554	.007913
30	100.000000	.010000	-.010000

I= 5.00 S(INCH)= 7.058253

CHORD= 11.448100Y/B/2= .249400

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.316432	.316432
2	2.500000	.483867	.174082
3	5.000000	.554648	.128091
4	7.500000	.609044	.095024
5	10.000000	.652741	.066827
6	12.500000	.689084	.041122
7	15.000000	.717696	.020048
8	17.500000	.741517	.001283
9	20.000000	.763530	-.018147
10	22.500000	.779909	-.034280
11	25.000000	.793310	-.049499
12	27.500000	.802921	-.062784
13	30.000000	.809947	-.075220
14	32.500000	.813632	-.085959
15	35.000000	.814255	-.095183
16	37.500000	.811283	-.102275
17	40.000000	.806470	-.108920
18	42.500000	.797096	-.112341
19	45.000000	.784215	-.113545
20	50.000000	.749500	-.110710
21	55.000000	.704509	-.102353
22	60.000000	.650687	-.089776
23	65.000000	.589195	-.074108
24	70.000000	.520913	-.056300
25	75.000000	.446955	-.037758
26	80.000000	.368651	-.020126
27	85.000000	.286967	-.005647
28	90.000000	.201597	.005147
29	95.000000	.110036	.009750
30	100.000000	.010000	-.010000

I= 6.00 S(INCH)= 8.628955

CHORD= 10.494200Y/B/2= .304900

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.278829	.278829
2	2.500000	.434163	.150190
3	5.000000	.500886	.109872
4	7.500000	.552476	.081287
5	10.000000	.594067	.056974
6	12.500000	.628757	.034785
7	15.000000	.656257	.016740
8	17.500000	.679282	.000727
9	20.000000	.700565	-.015979
10	22.500000	.716602	-.029745
11	25.000000	.729836	-.042747
12	27.500000	.739527	-.054045
13	30.000000	.746782	-.064630
14	32.500000	.750910	-.073724
15	35.000000	.752167	-.081492
16	37.500000	.750069	-.087368
17	40.000000	.746221	-.092895
18	42.500000	.738131	-.095528
19	45.000000	.726767	-.096188
20	50.000000	.695652	-.092883
21	55.000000	.654876	-.084755
22	60.000000	.605762	-.073003
23	65.000000	.549368	-.058666
24	70.000000	.486498	-.042620
25	75.000000	.418159	-.026165
26	80.000000	.345564	-.010819
27	85.000000	.269558	.001326
28	90.000000	.189844	.009764
29	95.000000	.103972	.012043
30	100.000000	.010000	-.010000

I= 7.00 S(INCH)= 10.196827

CHORD= 9.540270Y/B/2= .360300

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.262052	.262052
2	2.500000	.405002	.146842
3	5.000000	.467384	.111914
4	7.500000	.515886	.087528
5	10.000000	.555088	.066817
6	12.500000	.587837	.047858
7	15.000000	.613931	.032547
8	17.500000	.635856	.018982
9	20.000000	.656093	.004683
10	22.500000	.671458	-.007046
11	25.000000	.684178	-.018177
12	27.500000	.693585	-.027851
13	30.000000	.700687	-.036967
14	32.500000	.704857	-.044818
15	35.000000	.706329	-.051550
16	37.500000	.704663	-.056650
17	40.000000	.701321	-.061519
18	42.500000	.694038	-.063841
19	45.000000	.683692	-.064456
20	50.000000	.655123	-.061733
21	55.000000	.617434	-.054964
22	60.000000	.571826	-.045238
23	65.000000	.519262	-.033501
24	70.000000	.460469	-.020551
25	75.000000	.396358	-.007577
26	80.000000	.328029	.004041
27	85.000000	.256228	.012379
28	90.000000	.180691	.016980
29	95.000000	.099089	.015516
30	100.000000	.010000	-.010000

I= 8.00 S(INCH)= 11.374146

CHORD= 8.922740Y/B/2= .401900

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.253355	.253355
2	2.500000	.388587	.147138
3	5.000000	.448461	.116000
4	7.500000	.495273	.094642
5	10.000000	.533250	.076584
6	12.500000	.565066	.060039
7	15.000000	.590561	.046809
8	17.500000	.612069	.035124
9	20.000000	.631907	.022663
10	22.500000	.647100	.012515
11	25.000000	.659732	.002840
12	27.500000	.669183	-.005554
13	30.000000	.676396	-.013510
14	32.500000	.680785	-.020364
15	35.000000	.682569	-.026254
16	37.500000	.681338	-.030696
17	40.000000	.678460	-.035002
18	42.500000	.671815	-.037007
19	45.000000	.662227	-.037494
20	50.000000	.635443	-.035011
21	55.000000	.599810	-.029064
22	60.000000	.556449	-.020673
23	65.000000	.506255	-.010729
24	70.000000	.449901	.000016
25	75.000000	.388224	.010435
26	80.000000	.322249	.019233
27	85.000000	.252601	.024536
28	90.000000	.179044	.025930
29	95.000000	.099073	.020909
30	100.000000	.010000	-.010000

I= 9.00 S(INCH)= 12.551465

CHORD= 8.502760Y/B/2= .443500

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.193940	.193940
2	2.500000	.323953	.093868
3	5.000000	.382153	.065340
4	7.500000	.427888	.046114
5	10.000000	.465175	.030004
6	12.500000	.496577	.015321
7	15.000000	.521960	.003802
8	17.500000	.543554	-.006234
9	20.000000	.563570	-.016999
10	22.500000	.579172	-.025544
11	25.000000	.592351	-.033622
12	27.500000	.602517	-.040462
13	30.000000	.610569	-.046864
14	32.500000	.615952	-.052195
15	35.000000	.618873	-.056586
16	37.500000	.618943	-.059577
17	40.000000	.617465	-.062415
18	42.500000	.612420	-.063039
19	45.000000	.604592	-.062195
20	50.000000	.581749	-.057149
21	55.000000	.550553	-.048722
22	60.000000	.512063	-.037895
23	65.000000	.467116	-.025534
24	70.000000	.416332	-.012377
25	75.000000	.360470	.000463
26	80.000000	.300453	.011699
27	85.000000	.236758	.019428
28	90.000000	.168994	.023087
29	95.000000	.094360	.019876
30	100.000000	.010000	-.010000

I= 10.00 S(INCH)= 14.122167

CHORD= 7.943940Y/B/2= .499000

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.151121	.151121
2	2.500000	.273935	.058972
3	5.000000	.329651	.033660
4	7.500000	.373674	.016991
5	10.000000	.409726	.003156
6	12.500000	.440219	-.009408
7	15.000000	.465051	-.019053
8	17.500000	.486319	-.027337
9	20.000000	.506085	-.036327
10	22.500000	.521704	-.043269
11	25.000000	.535038	-.049795
12	27.500000	.545540	-.055181
13	30.000000	.554051	-.060175
14	32.500000	.560051	-.064184
15	35.000000	.563737	-.067330
16	37.500000	.564745	-.069182
17	40.000000	.564291	-.070906
18	42.500000	.560491	-.070576
19	45.000000	.554075	-.068889
20	50.000000	.534483	-.062424
21	55.000000	.507018	-.052871
22	60.000000	.472657	-.041157
23	65.000000	.432167	-.028105
24	70.000000	.386102	-.014431
25	75.000000	.335140	-.001206
26	80.000000	.280105	.010329
27	85.000000	.221383	.018336
28	90.000000	.158563	.022245
29	95.000000	.088912	.019323
30	100.000000	.010000	-.010000

I= 11.00 S(INCH)= 15.690039

CHORD= 7.385130Y/B/2= .554400

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.121660	.121660
2	2.500000	.237017	.037176
3	5.000000	.289993	.014823
4	7.500000	.332045	.000452
5	10.000000	.366599	-.011372
6	12.500000	.395911	-.022087
7	15.000000	.419918	-.030132
8	17.500000	.440575	-.036948
9	20.000000	.459801	-.044456
10	22.500000	.475136	-.050094
11	25.000000	.488318	-.055376
12	27.500000	.498838	-.059626
13	30.000000	.507480	-.063538
14	32.500000	.513762	-.066561
15	35.000000	.517868	-.068807
16	37.500000	.519459	-.069874
17	40.000000	.519667	-.070848
18	42.500000	.516739	-.069936
19	45.000000	.511355	-.067786
20	50.000000	.494228	-.060691
21	55.000000	.469677	-.050827
22	60.000000	.438607	-.039064
23	65.000000	.401718	-.026176
24	70.000000	.359520	-.012838
25	75.000000	.312626	-.000061
26	80.000000	.261790	.010991
27	85.000000	.207340	.018576
28	90.000000	.148875	.022146
29	95.000000	.083752	.019059
30	100.000000	.010000	-.010000

I= 12.00 S(INCH)= 17.257910

CHORD= 6.826300Y/B/2= .609800

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.097412	.097412
2	2.500000	.205119	.020399
3	5.000000	.255160	.000812
4	7.500000	.295052	-.011449
5	10.000000	.327926	-.021444
6	12.500000	.355883	-.030486
7	15.000000	.378889	-.037106
8	17.500000	.398763	-.042626
9	20.000000	.417277	-.048823
10	22.500000	.432159	-.053327
11	25.000000	.445018	-.057534
12	27.500000	.455388	-.060817
13	30.000000	.463994	-.063815
14	32.500000	.470391	-.066020
15	35.000000	.474750	-.067532
16	37.500000	.476758	-.067981
17	40.000000	.477463	-.068368
18	42.500000	.475243	-.067038
19	45.000000	.470729	-.064590
20	50.000000	.455746	-.057182
21	55.000000	.433801	-.047316
22	60.000000	.405726	-.035799
23	65.000000	.372165	-.023351
24	70.000000	.333583	-.010599
25	75.000000	.290538	.001512
26	80.000000	.243717	.011896
27	85.000000	.193396	.018916
28	90.000000	.139186	.022046
29	95.000000	.078542	.018743
30	100.000000	.010000	-.010000

I= 13.00 S(INCH)= 18.825782

CHORD= 6.267480Y/B/2= .665200

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.076455	.076455
2	2.500000	.176343	.006745
3	5.000000	.223281	-.010245
4	7.500000	.260851	-.020559
5	10.000000	.291892	-.028877
6	12.500000	.318349	-.036390
7	15.000000	.340217	-.041723
8	17.500000	.359174	-.046081
9	20.000000	.376845	-.051098
10	22.500000	.391149	-.054594
11	25.000000	.403563	-.057849
12	27.500000	.413662	-.060284
13	30.000000	.422115	-.062486
14	32.500000	.428513	-.063986
15	35.000000	.433013	-.064875
16	37.500000	.435331	-.064814
17	40.000000	.436427	-.064721
18	42.500000	.434814	-.063075
19	45.000000	.431070	-.060426
20	50.000000	.418044	-.052895
21	55.000000	.398530	-.043202
22	60.000000	.373291	-.032090
23	65.000000	.342916	-.020222
24	70.000000	.307826	-.008180
25	75.000000	.268525	.003160
26	80.000000	.225635	.012792
27	85.000000	.179383	.019186
28	90.000000	.129392	.021842
29	95.000000	.073232	.018329
30	100.000000	.010000	-.010000

I= 14.00 S(INCH)= 20.393654

CHORD= 5.708670Y/B/2= .720600

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.055906	.055906
2	2.500000	.147816	-.006660
3	5.000000	.191494	-.021211
4	7.500000	.226594	-.029725
5	10.000000	.255672	-.036498
6	12.500000	.280511	-.042599
7	15.000000	.301132	-.046754
8	17.500000	.319070	-.050052
9	20.000000	.335807	-.053981
10	22.500000	.349446	-.056555
11	25.000000	.361337	-.058935
12	27.500000	.371096	-.060594
13	30.000000	.379331	-.062064
14	32.500000	.385672	-.062916
15	35.000000	.390262	-.063235
16	37.500000	.392843	-.062708
17	40.000000	.394291	-.062174
18	42.500000	.393252	-.060245
19	45.000000	.390251	-.057423
20	50.000000	.379145	-.049804
21	55.000000	.362050	-.040297
22	60.000000	.339659	-.029577
23	65.000000	.312506	-.018255
24	70.000000	.280968	-.006863
25	75.000000	.245498	.003793
26	80.000000	.206653	.012786
27	85.000000	.164613	.018700
28	90.000000	.119021	.021060
29	95.000000	.067574	.017566
30	100.000000	.010000	-.010000

I= 15.00 S(INCH)= 21.961526

CHORD= 5.149850Y/B/2= .776000

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.038585	.038585
2	2.500000	.122350	-.017005
3	5.000000	.162600	-.029283
4	7.500000	.195071	-.036158
5	10.000000	.222039	-.041531
6	12.500000	.245126	-.046356
7	15.000000	.264372	-.049460
8	17.500000	.281169	-.051821
9	20.000000	.296853	-.054779
10	22.500000	.309715	-.056543
11	25.000000	.320975	-.058157
12	27.500000	.330288	-.059144
13	30.000000	.338205	-.059982
14	32.500000	.344391	-.060285
15	35.000000	.348977	-.060127
16	37.500000	.351730	-.059228
17	40.000000	.353440	-.058342
18	42.500000	.352886	-.056218
19	45.000000	.350544	-.053307
20	50.000000	.341195	-.045765
21	55.000000	.326364	-.036598
22	60.000000	.306673	-.026419
23	65.000000	.282601	-.015781
24	70.000000	.254485	-.005170
25	75.000000	.222723	.004679
26	80.000000	.187812	.012923
27	85.000000	.149891	.018261
28	90.000000	.108620	.020249
29	95.000000	.061848	.016735
30	100.000000	.010000	-.010000

I= 16.00 S(INCH)= 23.529398

CHORD= 4.591040Y/B/2= .831400

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.023149	.023149
2	2.500000	.098591	-.025642
3	5.000000	.135238	-.035824
4	7.500000	.164914	-.041224
5	10.000000	.189626	-.045343
6	12.500000	.210831	-.049022
7	15.000000	.228580	-.051198
8	17.500000	.244123	-.052733
9	20.000000	.258650	-.054826
10	22.500000	.270638	-.055877
11	25.000000	.281176	-.056816
12	27.500000	.289960	-.057215
13	30.000000	.297479	-.057500
14	32.500000	.303436	-.057328
15	35.000000	.307949	-.056763
16	37.500000	.310809	-.055556
17	40.000000	.312722	-.054377
18	42.500000	.312599	-.052114
19	45.000000	.310862	-.049168
20	50.000000	.303176	-.041795
21	55.000000	.290527	-.033050
22	60.000000	.273467	-.023481
23	65.000000	.252420	-.013585
24	70.000000	.227681	-.003800
25	75.000000	.199597	.005213
26	80.000000	.168605	.012694
27	85.000000	.134811	.017464
28	90.000000	.097901	.019118
29	95.000000	.035893	.015676
30	100.000000	.010000	-.010000

I= 17.00 S(INCH)= 25.097270

CHORD= 4.032220Y/B/2= .886800

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.013899	.013899
2	2.500000	.080797	-.028315
3	5.000000	.113618	-.036622
4	7.500000	.140291	-.040756
5	10.000000	.162559	-.043811
6	12.500000	.181707	-.046517
7	15.000000	.197796	-.047927
8	17.500000	.211927	-.048797
9	20.000000	.225143	-.050177
10	22.500000	.236108	-.050664
11	25.000000	.245780	-.051072
12	27.500000	.253891	-.051026
13	30.000000	.260871	-.050900
14	32.500000	.266460	-.050392
15	35.000000	.270758	-.049562
16	37.500000	.273584	-.048188
17	40.000000	.275555	-.046861
18	42.500000	.275715	-.044605
19	45.000000	.274434	-.041772
20	50.000000	.268101	-.034880
21	55.000000	.257307	-.026884
22	60.000000	.242535	-.018269
23	65.000000	.224153	-.009474
24	70.000000	.202422	-.000883
25	75.000000	.177648	.006923
26	80.000000	.150216	.013282
27	85.000000	.120218	.017155
28	90.000000	.087383	.018190
29	95.000000	.049940	.014618
30	100.000000	.010000	-.010000

I= 18.00 S(INCH)= 26.665141

CHORD= 3.473410Y/B/2= .942200

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.022580	.022580
2	2.500000	.080541	-.013450
3	5.000000	.109147	-.020273
4	7.500000	.132434	-.023522
5	10.000000	.151886	-.025883
6	12.500000	.168607	-.027988
7	15.000000	.182650	-.029019
8	17.500000	.194957	-.029633
9	20.000000	.206422	-.030743
10	22.500000	.215884	-.031145
11	25.000000	.224166	-.031546
12	27.500000	.231032	-.031627
13	30.000000	.236852	-.031712
14	32.500000	.241400	-.031540
15	35.000000	.244765	-.031162
16	37.500000	.246793	-.030385
17	40.000000	.248022	-.029712
18	42.500000	.247631	-.028297
19	45.000000	.245948	-.026437
20	50.000000	.239205	-.021787
21	55.000000	.228506	-.016300
22	60.000000	.214335	-.010325
23	65.000000	.197082	-.004168
24	70.000000	.177042	.001912
25	75.000000	.154548	.007484
26	80.000000	.129994	.012037
27	85.000000	.103511	.014731
28	90.000000	.074902	.015299
29	95.000000	.042669	.012242
30	100.000000	.010000	-.010000

Y= 19.00 S(INCH)= .491893

CHORD= 2.461800Y/B/2= .973700

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	-.031850	-.031850
2	2.500000	.014890	-.051726
3	5.000000	.040762	-.050964
4	7.500000	.062146	-.048389
5	10.000000	.079614	-.046381
6	12.500000	.094184	-.045154
7	15.000000	.106296	-.043726
8	17.500000	.116772	-.042408
9	20.000000	.126269	-.041822
10	22.500000	.134015	-.041068
11	25.000000	.140670	-.040568
12	27.500000	.146129	-.040032
13	30.000000	.150697	-.039649
14	32.500000	.154250	-.039199
15	35.000000	.156884	-.038682
16	37.500000	.158522	-.037930
17	40.000000	.159571	-.037275
18	42.500000	.159472	-.036094
19	45.000000	.158474	-.034580
20	50.000000	.154195	-.030785
21	55.000000	.147319	-.026188
22	60.000000	.138233	-.020996
23	65.000000	.127227	-.015410
24	70.000000	.114498	-.009626
25	75.000000	.100252	-.003981
26	80.000000	.084717	.001114
27	85.000000	.067909	.004985
28	90.000000	.049601	.007357
29	95.000000	.028627	.007061
30	100.000000	.010000	-.010000

I= 20.00 S(INCH)= 1.662281

CHORD= 1.488240Y/B/2= .982700

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	-.058118	-.058118
2	2.500000	-.030079	-.070351
3	5.000000	-.014629	-.070081
4	7.500000	-.001587	-.068409
5	10.000000	.009596	-.066573
6	12.500000	.019431	-.064804
7	15.000000	.028010	-.062684
8	17.500000	.035763	-.060466
9	20.000000	.043077	-.058540
10	22.500000	.049464	-.056380
11	25.000000	.055287	-.054277
12	27.500000	.060456	-.052084
13	30.000000	.065135	-.049935
14	32.500000	.069231	-.047715
15	35.000000	.072784	-.045442
16	37.500000	.075731	-.043031
17	40.000000	.078301	-.040699
18	42.500000	.080143	-.038083
19	45.000000	.081395	-.035312
20	50.000000	.082337	-.029489
21	55.000000	.081409	-.023483
22	60.000000	.078787	-.017472
23	65.000000	.074604	-.011625
24	70.000000	.068944	-.006093
25	75.000000	.061901	-.001111
26	80.000000	.053597	.003056
27	85.000000	.043998	.005959
28	90.000000	.032962	.007423
29	95.000000	.023073	.003073
30	100.000000	.010000	-.010000

I= 21.00 S(INCH)= 3.131768

CHORD= .969010Y/B/2= .994000

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	-.048322	-.048322
2	2.500000	-.030443	-.056664
3	5.000000	-.020756	-.056862
4	7.500000	-.012596	-.056105
5	10.000000	-.005577	-.055171
6	12.500000	.000625	-.054221
7	15.000000	.006049	-.053003
8	17.500000	.010968	-.051688
9	20.000000	.015636	-.050528
10	22.500000	.019733	-.049183
11	25.000000	.023493	-.047846
12	27.500000	.026856	-.046420
13	30.000000	.029928	-.044996
14	32.500000	.032647	-.043498
15	35.000000	.035040	-.041938
16	37.500000	.037065	-.040262
17	40.000000	.038870	-.038612
18	42.500000	.040228	-.036750
19	45.000000	.041228	-.034762
20	50.000000	.042289	-.030522
21	55.000000	.042238	-.026058
22	60.000000	.041191	-.021485
23	65.000000	.039235	-.016909
24	70.000000	.036429	-.012428
25	75.000000	.032838	-.008190
26	80.000000	.028545	-.004363
27	85.000000	.023545	-.001223
28	90.000000	.019442	-.000558
29	95.000000	.016416	-.003584
30	100.000000	.010000	-.010000

INTERP ZS ON WING (INCH)

CHORD= 15.742600Y/B/2= 0.000000

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.995245	.995245
2	2.500000	1.202815	.776821
3	5.000000	1.277488	.690918
4	7.500000	1.329803	.622960
5	10.000000	1.367710	.562004
6	12.500000	1.395796	.504764
7	15.000000	1.413495	.454141
8	17.500000	1.42486A	.406951
9	20.000000	1.434055	.359150
10	22.500000	1.435831	.316217
11	25.000000	1.433866	.274895
12	27.500000	1.427067	.236611
13	30.000000	1.417113	.199895
14	32.500000	1.402988	.165935
15	35.000000	1.385094	.134502
16	37.500000	1.362719	.106459
17	40.000000	1.338290	.079512
18	42.500000	1.308086	.057494
19	45.000000	1.273572	.039037
20	50.000000	1.193835	.010936
21	55.000000	1.102205	-.007333
22	60.000000	1.000790	-.017442
23	65.000000	.891310	-.020817
24	70.000000	.775107	-.018635
25	75.000000	.653882	-.012660
26	80.000000	.529630	-.004989
27	85.000000	.404069	.001688
28	90.000000	.277081	.006938
29	95.000000	.146534	.008629
30	100.000000	.010000	-.010000

INTERP ZS ON WING (INCH)

CHORD= 9.063300Y/B/2= .387968

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.256268	.256268
2	2.500000	.393188	.147935
3	5.000000	.453564	.115866
4	7.500000	.500689	.093747
5	10.000000	.538868	.075008
6	12.500000	.570817	.057834
7	15.000000	.596369	.044051
8	17.500000	.617893	.031860
9	20.000000	.637745	.018903
10	22.500000	.652902	.008320
11	25.000000	.665480	-.001760
12	27.500000	.674850	-.010516
13	30.000000	.681970	-.018805
14	32.500000	.686243	-.025951
15	35.000000	.687894	-.032094
16	37.500000	.686506	-.036745
17	40.000000	.683467	-.041234
18	42.500000	.676626	-.043362
19	45.000000	.666818	-.043926
20	50.000000	.639545	-.041471
21	55.000000	.603378	-.035404
22	60.000000	.559457	-.026758
23	65.000000	.508692	-.016436
24	70.000000	.451770	-.005202
25	75.000000	.389545	.005805
26	80.000000	.323060	.015270
27	85.000000	.252969	.021311
28	90.000000	.179027	.023501
29	95.000000	.098788	.019393
30	100.000000	.010000	-.010000

INTERP ZS ON WING (INCH)

CHORD= 3.194000Y/B/2= .969917

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	.026923	.026923
2	2.500000	.080415	-.006014
3	5.000000	.106913	-.012096
4	7.500000	.128507	-.014904
5	10.000000	.146550	-.016919
6	12.500000	.162058	-.018722
7	15.000000	.175078	-.019565
8	17.500000	.186473	-.020051
9	20.000000	.197061	-.021025
10	22.500000	.205772	-.021385
11	25.000000	.213359	-.021784
12	27.500000	.219603	-.021928
13	30.000000	.224842	-.022118
14	32.500000	.228869	-.022115
15	35.000000	.231768	-.021964
16	37.500000	.233397	-.021484
17	40.000000	.234253	-.021139
18	42.500000	.233587	-.020144
19	45.000000	.231703	-.018771
20	50.000000	.224755	-.015242
21	55.000000	.214103	-.011010
22	60.000000	.200232	-.006356
23	65.000000	.183542	-.001518
24	70.000000	.164348	.003306
25	75.000000	.142994	.007760
26	80.000000	.119879	.011411
27	85.000000	.095154	.013516
28	90.000000	.068660	.013851
29	95.000000	.039033	.011053
30	100.000000	.010000	-.010000

INTERP ZS ON WINGLET (INCH)

CHORD= 3.194000Y/B/2= .969917

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	-.020809	-.020809
2	2.500000	.038160	-.048269
3	5.000000	.070060	-.048948
4	7.500000	.096184	-.047227
5	10.000000	.117308	-.046161
6	12.500000	.134743	-.046037
7	15.000000	.149040	-.045602
8	17.500000	.161262	-.045262
9	20.000000	.172261	-.045825
10	22.500000	.181038	-.046119
11	25.000000	.188445	-.046697
12	27.500000	.194350	-.047180
13	30.000000	.199146	-.047814
14	32.500000	.202673	-.048311
15	35.000000	.205060	-.048671
16	37.500000	.206207	-.048675
17	40.000000	.206642	-.048750
18	42.500000	.205643	-.048088
19	45.000000	.203535	-.046938
20	50.000000	.196531	-.043466
21	55.000000	.186404	-.038709
22	60.000000	.173664	-.032924
23	65.000000	.158701	-.026359
24	70.000000	.141787	-.019255
25	75.000000	.123208	-.012026
26	80.000000	.103281	-.005188
27	85.000000	.082087	.000448
28	90.000000	.059366	.004557
29	95.000000	.033839	.005859
30	100.000000	.010000	-.010000

INTERP ZS ON WINGLET (INCH)

CHORD= 1.730000Y/B/2= .977439

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	-.042763	-.042763
2	2.500000	-.008221	-.055035
3	5.000000	.011652	-.052808
4	7.500000	.028320	-.049357
5	10.000000	.042149	-.046393
6	12.500000	.053865	-.044053
7	15.000000	.063798	-.041628
8	17.500000	.072535	-.039327
9	20.000000	.080532	-.037592
10	22.500000	.087249	-.035789
11	25.000000	.093149	-.034214
12	27.500000	.098160	-.032662
13	30.000000	.102496	-.031267
14	32.500000	.106068	-.029875
15	35.000000	.108943	-.028488
16	37.500000	.111066	-.026988
17	40.000000	.112721	-.025610
18	42.500000	.113513	-.023918
19	45.000000	.113617	-.022049
20	50.000000	.112044	-.017948
21	55.000000	.108402	-.013529
22	60.000000	.102951	-.008946
23	65.000000	.095882	-.004355
24	70.000000	.087320	.000094
25	75.000000	.077389	.004141
26	80.000000	.066230	.007479
27	85.000000	.053792	.009573
28	90.000000	.039880	.010193
29	95.000000	.025862	.005862
30	100.000000	.010000	-.010000

INTERP ZS ON WINGLET (INCH)

CHORD= .691600Y/B/2= 1.000000

I	PCTX	ZUP(IN)	ZLO(IN)
1	0.000000	-.043121	-.043121
2	2.500000	-.030016	-.050016
3	5.000000	-.024042	-.049811
4	7.500000	-.018481	-.049534
5	10.000000	-.013677	-.049073
6	12.500000	-.009409	-.048554
7	15.000000	-.005664	-.047810
8	17.500000	-.002252	-.046971
9	20.000000	.001007	-.046215
10	22.500000	.003885	-.045301
11	25.000000	.006548	-.044367
12	27.500000	.008951	-.043348
13	30.000000	.011168	-.042307
14	32.500000	.013155	-.041191
15	35.000000	.014931	-.040010
16	37.500000	.016466	-.038724
17	40.000000	.017865	-.037435
18	42.500000	.018966	-.035974
19	45.000000	.019833	-.034402
20	50.000000	.020960	-.031006
21	55.000000	.021379	-.027365
22	60.000000	.021173	-.023560
23	65.000000	.020406	-.019665
24	70.000000	.019121	-.015749
25	75.000000	.017370	-.011913
26	80.000000	.015213	-.008273
27	85.000000	.013825	-.006175
28	90.000000	.013734	-.006266
29	95.000000	.012881	-.007119
30	100.000000	.010000	-.010000

I. Link (0) - (System Control)

Item (1) -- Alphanumeric Identification
(2) cards, (72 columns each)

Item (2) -- Next Link Number
(Col. 1-5, Right Justified)

II. Link (1) - (Planform and Airfoil Sections)

Item (1) -- (1) card, (Col. 1-10, Right-Justified)
KASE (= 0, New Case)
($\neq$ 0, Link 1 Def. on File 1)

Item (2) -- (1) card, (4 fields of 10 col. each)
Leading and Trailing Edge Data

(a) - (Col. 1-10, Right-Justified)
= 1 (Straight Line(s) on leading edge)
= 2 (Cubic curve on leading edge)

(b) - (Col. 11-20, Right-Justified)
(No. of points on leading edge)

(c) - (Col. 21-30, Right-Justified)
Same as (a) above for T.E.

(d) - (Col. 31-40, Right-Justified)
Same as (b) above for T.E.

Item (3) -- See form for L.E. and T.E. data

Item (4) -- (1) card, (9 data fields)
Airfoil Definition Data (21 Limit)

(a) - (Col. 1-5, Right-Justified)
= 1 (No airfoil fit)
= 2 (Fit straight lines)
= 3 (Fit cubics)

(b) - (Col. 6-10, R-J)
No. of given airfoils. (Max. 21)

(c) - (Col. 11-15, R-J)
No. of points per airfoil. (Max. 30)

(d) - (Col. 16-20, R-J)
No. of camber line points

(e) - (Col. 21-50, Left-Justified with decimal)
L.E. Radius

(f) - (Col. 31-40, L-J w D)
T.E. Radius

(g) - (Col. 41-50, L-J w D)
L.E. Thickness

(h) - (Col. 51-60, L-J w D)
T.E. Thickness

(i) - (Col. 61-70, L-J w D) (FAC = 1.0)

Item (5) - See form for airfoil WB lines.
YDEM for WB (lines)

Item (6) -- (1) card, (Max. of 20, one Col. fields)
A one in the (ith) column will apply a cubic fit to all surface lines between the (ith) and (i + 1st) airfoils.
A zero will cause a straight line fit.

Item (7) -- (1) card, (Max. of 31, one Col. fields)
A one in the (ith) column will cause the (ith) airfoil to be read from cards. A zero will make the (ith) airfoil identical with the (i - 1st) airfoil.

Item (8) -- See form for airfoil ordinates percent-of-chord locations.

Item (9) -- See form for airfoil ordinates. (order: percent, upper, lower)

CONTROL RETURNS TO LINK (0) FOR ITEM (2).

III. Link (3) - (Spanwise Percent Line Arrays)

Item (1) -- (1) card, (3 fields of 10 Col. each)

(a) - (Col. 1-10, R-J)
(No. of percent line values in this set - Max. 31)

(b) - (Col. 11-20, R-J)
= 1 (Read another set of line values)
= 0 (This is the last set of lines)

(c) - (Col. 21-30, R-J)
= 0 (In all cases)

Item (2) -- See form for percent line values.

CONTROL RETURNS TO LINK (0) FOR ITEM (2).

IV. Link (5) - (Cutter Motion and Surface Parameters)

Item (1) -- (1) card, (7 fields of 10 Col. each)

(a) - (Col. 1-10 R-J)
= 0 (Output both surfaces)
= 1 (Output upper surface only)
= 2 (Output lower surface only)

(b) - (Col. 11-20, R-J)
= 1 (MDI)

(c) - (Col. 21-30, R-J)
= 0 (Do not invert lower surf. Z)
= 1 (Do invert lower surf. Z)

(d) - (Col. 31-40, R-J)
= 0 (This is last case)
≠ 0 (Another case follows)

(e) - (Col. 41-50, R-J)
= 0 (Output cutter center)
= 1 (Output surf. points and normals)

(f) - (Col. 51-60, R-J)
= 0 (No plot output)
≠ 0 (Generate plot tape)

(g) - (Col. 61-70, R-J)
(Line print increment)

Item (2) -- (2) cards, (8 fields of 10 Col. each)

(a) - (Col. 1-10, L-J w decimal)
YS = (Outboard WBL for line cuts)

(b) - (Col. 11-20, L-J w dec.)
YE = (Inboard WBL for line cuts)

(c) - (Col. 21-30, L-J w dec.)
DY = (Point increment for line cuts)

(d) - (Col. 31-40, L-J w dec.)
PS = (First cut percent line)

(e) - (Col. 41-50, L-J w dec.)
PE = (Last cut percent line)

(f) - (Col. 51-60, L-J e dec.)
a = (Rotation angle, usually 0)

(g) - (Col. 61-70, L-J w dec.)
R = (Cutter radius)

(h) - (Col. 1-10. L-J w dec.)
PM = (1.0, Not used currently)

Item (3) -- (1) card, (1 field of 10 Col.)
(a) - (Col. 1-10, R-J)
NB = (No. of Butt Blocks.)

IF NB $\neq$ 0 Include ITEM (3.1)

Item (3.1) -- (1) card, ($3 \leq N \leq 7$ (10) Col. fields)

(a) - (Col. 1-10, L-J w dec.)
YB = (Y line at butt blocks)

(b) - (Cols. 11-20, 21-30, ...61-70)
$X_{N,M}$ = (Butt block × locations)
($1 \leq N \leq 3$; M = 1, 2)

CONTROL RETURNS TO LINK (0) FOR ITEM (2).

V. Link (6) - (Postprocessor Control Commands)

Items (1-N) -- (One statement per card.)

The input for Link (6) must be selected from the list that follows:

STATEMENT		FUNCTION
(1)	PARTNO - 66 Characters -	Part I.D.
(2)	MACHIN/"Name", N, Mode	Postprocessor Selection
(3)	CLEARP/XYPLAN, Z	Clearance Plane
	YZPLAN, X	Clearance Plane
	ZXPLAN, Y	Clearnace Plane
(4)	TRANS /"X", "Y", "Z"	Coordinate Translation
(5)	FROM /"X", "Y", "Z"	Set Point
(6)	GO TO /"X", "Y", "Z"	Go to point
(7)	GODLTA/"X", "Y", "Z"	End-of-line retract
(8)	COOLNT/FLOOD	Coolant Control
	MIST	Coolant Control
	OFF	Coolant Control
(9)	SPINDL/ON, CLW	Spindle Control
	ON, CCLW	Spindle Control
	OFF	Spindle Control
(10)	TMARK /N	Manual Rewind Stop
	N, AUTO	Auto Rewind Stop
(11)	MCHTOL/e	Corner Tolerance
(12)	INTOL/e	Surface Tolerance
(13)	OUTTOL/e	Surface Tolerance
(14)	REWIND/N	Automatic Rewind
(15)	RETRCT	Move to CLEARP
(16)	OPSTOP	Optional Stop Code
(17)	STOP	Stop Code
(18)	END	Process Points
(19)	FINI	Program End

CONTROL RETURNS TO LINK (0) FOR ITEM (2).

```
          WING KUHLMAN UPPER 1.0 MILL 6/4/79 JMK  50-99 PERCENT
C
    1
          0
          1          3          1          3
0.0         0.0         8.5902     10.979849 21.4754    27.449572
15.7426     0.0         17.6535    10.979849 24.6694    27.449572
    3   21    30     00.0          0.0         0.0         0.0         1.0
0.0         .786766    2.354638   3.922510  5.490381  7.058253  8.628955
10.196827 10.979849 11.374146 12.551465 14.122167 15.690039 17.25791
18.825782 20.393654 21.961526 23.529398 25.09727  26.665141 27.449572
00000000000000000000
11111111111111111111
  0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
 17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
 35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
 60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
 95.000000100.000000
   .995245  1.202815  1.277488  1.329803  1.367710  1.395796  1.413495
  1.424868  1.434055  1.435831  1.433866  1.427067  1.417113  1.402988
  1.385094  1.362719  1.338290  1.308086  1.273572  1.193835  1.102205
  1.000790   .891310   .775107   .653882   .529630   .404069   .277081
   .146534   .010000
   .995245   .776821   .690918   .622960   .562004   .504764   .454141
   .406951   .359150   .316217   .274895   .236611   .199895   .165935
   .134502   .106459   .079512   .057494   .039037   .010936  -.007333
  -.017442  -.020817  -.018635  -.012660  -.004989   .001688   .006938
   .008629  -.010000
  0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
 17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
 35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
 60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
 95.000000100.000000
   .851330  1.056410  1.132631  1.187220  1.227910  1.259126  1.280283
  1.295299  1.308178  1.313844  1.315845  1.313112  1.307265  1.297313
  1.283640  1.265551  1.245394  1.219557  1.189457  1.118607  1.035852
   .943213   .842337   .734507   .621346   .504767   .386381   .266029
   .141446   .010000
   .851330   .643350   .563872   .501839   .446668   .395150   .350058
   .308289   .265911   .228226   .192065   .158803   .127006   .097821
   .071020   .047436   .024837   .006937  -.007593  -.028375  -.039997
  -.044101  -.042094  -.035134  -.024958  -.013619  -.003782   .004088
   .007728  -.010000
  0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
 17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
 35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
 60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
 95.000000100.000000
   .564534   .764623   .843919   .903030   .949259   .986706  1.014749
```

Input Deck for Numerically Controlled (NC) Machining of Wing

```
 1.037020  1.057253  1.070669  1.080571  1.085937  1.088273  1.086636
 1.081373  1.071824  1.060180  1.043046  1.021743   .968609   .903546
  .828402   .744680   .653542   .556460   .455181   .351105   .243985
  .131297   .010000
  .564536   .377400   .310736   .260520   .216884   .176772   .142710
  .111748   .080180   .052956   .027083   .003830  -.018161  -.037828
 -.055397  -.070098  -.084031  -.093725  -.100431  -.106629  -.105009
 -.097156  -.084430  -.067958  -.049417  -.030780  -.014653  -.001571
  .005943  -.010000
 0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
  .443664   .633925   .711442   .770064   .816571   .854902   .884207
  .908179   .930201   .945807   .958079   .966064   .971162   .972491
  .970372   .964187   .955978   .942572   .925202   .880400   .824135
  .758110   .683704   .601475   .514265   .422167   .326917   .228223
  .123530   .010000
  .443664   .272514   .213802   .170384   .133016   .098658   .070298
  .044587   .018261  -.004765  -.025182  -.043905  -.061517  -.077016
 -.090620  -.101614  -.111960  -.119421  -.122183  -.123162  -.117189
 -.105750  -.090137  -.071430  -.051224  -.031398  -.014460  -.000964
  .006532  -.010000
 0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
  .368965   .548121   .622578   .679399   .724820   .762431   .791767
  .815995   .838346   .854674   .867846   .876980   .883378   .886220
  .885804   .881557   .875374   .864309   .849504   .810377   .760360
  .701026   .633640   .559168   .478834   .394095   .306043   .214376
  .116554   .010000
  .368965   .212523   .160480   .122550   .090085   .060478   .035989
  .014082  -.008462  -.027357  -.045189  -.060859  -.075545  -.088330
 -.099411  -.108123  -.116290  -.120906  -.123060  -.121509  -.113733
 -.101135  -.084932  -.066141  -.046267  -.027077  -.010952   .001557
  .007913  -.010000
 0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
  .316432   .483867   .554648   .609044   .652741   .689084   .717696
  .741517   .763530   .779909   .793310   .802921   .809947   .813632
  .814255   .811283   .806470   .797096   .784215   .749500   .704509
  .650687   .589195   .520913   .446955   .368651   .286967   .201597
  .110036   .010000
```

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 .001283  -.018147  -.034280  -.049499  -.062784  -.075220  -.085959
-.095183  -.102275  -.108920  -.112341  -.113545  -.110710  -.102353
-.089776  -.074108  -.056300  -.037758  -.020126  -.005647   .005147
 .009750  -.010000
0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
 .278829   .434163   .500886   .552476   .594067   .628757   .656257
 .679282   .700565   .716602   .729836   .739527   .746782   .750910
 .752167   .750069   .746221   .738131   .726767   .695652   .654876
 .605762   .549368   .486498   .418159   .345564   .269558   .189844
 .103972   .010000
 .278829   .150190   .109872   .081287   .056974   .034785   .016740
 .000727  -.015979  -.029745  -.042747  -.054045  -.064630  -.073724
-.081492  -.087368  -.092895  -.095528  -.096188  -.092883  -.084755
-.073003  -.058666  -.042620  -.026165  -.010819   .001326   .009764
 .012043  -.010000
0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
 .262052   .405002   .467384   .515886   .555088   .587837   .613931
 .635856   .656093   .671458   .684178   .693585   .700687   .704857
 .706329   .704663   .701321   .694038   .683692   .655123   .617434
 .571826   .519262   .460469   .396358   .328029   .256228   .180691
 .099089   .010000
 .262052   .146842   .111914   .087528   .066817   .047858   .032547
 .018982   .004683  -.007046  -.018177  -.027851  -.036967  -.044818
-.051550  -.056650  -.061519  -.063841  -.064456  -.061733  -.054964
-.045238  -.033501  -.020551  -.007577   .004041   .012379   .016980
 .015516  -.010000
0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
 .256268   .393188   .453564   .500689   .538868   .570817   .596369
 .617893   .637745   .652902   .665480   .674850   .681970   .686243
 .687894   .686506   .683467   .676626   .666818   .639545   .603378
 .559457   .508692   .451770   .389545   .323060   .252969   .179027
 .098788   .010000
 .256268   .147935   .115866   .093747   .075008   .057834   .044051
 .031860   .018903   .008320  -.001760  -.010516  -.018805  -.025951
-.032084  -.036745  -.041234  -.043362  -.043926  -.041471  -.035404
-.026758  -.016436  -.005202   .005805   .015270   .021311   .023501
```

```
  .019393  -.010000
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17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
  .253355   .388587   .448461   .495273   .533250   .565066   .590561
  .612069   .631907   .647100   .659732   .669183   .676396   .680785
  .682569   .681338   .678460   .671815   .662227   .635443   .599810
  .556449   .506255   .449901   .388224   .322249   .252601   .179044
  .099073   .010000
  .253355   .147138   .116000   .094642   .076584   .060039   .046809
  .035124   .022663   .012515   .002840  -.005554  -.013510  -.020364
 -.026254  -.030696  -.035002  -.037007  -.037494  -.035011  -.029064
 -.020673  -.010729   .000016   .010435   .019233   .024536   .025930
  .020909  -.010000
 0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
  .193940   .323953   .382153   .427888   .465175   .496577   .521960
  .543554   .563570   .579172   .592351   .602517   .610569   .615952
  .618873   .618943   .617465   .612420   .604592   .581749   .550553
  .512063   .467116   .416332   .360470   .300453   .236758   .168994
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  .019876  -.010000
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17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
  .151121   .273935   .329651   .373674   .409726   .440219   .465051
  .486319   .506085   .521704   .535038   .545540   .554051   .560051
  .563737   .564745   .564291   .560491   .554075   .534483   .507018
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35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
```

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60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
  .121660   .237017   .289993   .332045   .366599   .395911   .419918
  .440575   .459801   .475136   .488318   .498838   .507480   .513762
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35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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95.000000100.000000
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 -.032090  -.020222  -.008180   .003160   .012792   .019186   .021942
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35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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  .049940   .010000
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17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
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95.000000100.000000
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-.010325  -.004168   .001912   .007484   .012037   .014731   .015299
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17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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-.021964  -.021484  -.021139  -.020144  -.018771  -.015242  -.011010
-.006356  -.001518   .003306   .007760   .011411   .013516   .013851
 .011053  -.010000
   3
        26              1               0
                 8.0     12.0    16.0    20.0    24.0
0.0       4.0           36.0    40.0    44.0    48.0    52.0
28.0      32.0          64.0    68.0    72.0    76.0    80.0
56.0      60.0          92.0    96.0    100.0
84.0      88.0
        25              1               0
                 8.5     12.5    16.5    20.5    24.5
0.5       4.5           36.5    40.5    44.5    48.5    52.5
28.5      32.5          64.5    68.5    72.5    76.5    80.5
56.5      60.5          92.5    96.5
84.5      88.5
        25              1               0
                 9.0     13.0    17.0    21.0    25.0
1.0       5.0           37.0    41.0    45.0    49.0    53.0
29.0      33.0          65.0    69.0    73.0    77.0    81.0
57.0      61.0
```

```
85.0        89.0        93.0        97.0
          25          1           0
1.5         5.5         9.5        13.5        17.5        21.5        25.5
29.5        33.5        37.5        41.5        45.5        49.5        53.5
57.5        61.5        65.5        69.5        73.5        77.5        81.5
85.5        89.5        93.5        97.5
          25          1           0
2.0         6.0        10.0        14.0        18.0        22.0        26.0
30.0        34.0        38.0        42.0        46.0        50.0        54.0
58.0        62.0        66.0        70.0        74.0        78.0        82.0
86.0        90.0        94.0        98.0
          25          1           0
2.5         6.5        10.5        14.5        18.5        22.5        26.5
30.5        34.5        38.5        42.5        46.5        50.5        54.5
58.5        62.5        66.5        70.5        74.5        78.5        82.5
86.5        90.5        94.5        98.5
          25          1           0
3.0         7.0        11.0        15.0        19.0        23.0        27.0
31.0        35.0        39.0        43.0        47.0        51.0        55.0
59.0        63.0        67.0        71.0        75.0        79.0        83.0
87.0        91.0        95.0        99.0
          25          0           0
3.5         7.5        11.5        15.5        19.5        23.5        27.5
31.5        35.5        39.5        43.5        47.5        51.5        55.5
59.5        63.5        67.5        71.5        75.5        79.5        83.5
87.5        91.5        95.5        99.5
     5
          1           1           1           0           0           0          10
27.449572 0.0         1.646972    50.0        99.0        0.0         .505
1.0
          0
     6
PARTNO    WING KUHLMAN UPPER 1.0 MILL 6/4/79 JMK  50-99 PERCENT
          MACHIN/SUNTRN,3,,LINEAR
          CLEARP/XYPLAN,3.0
          FEDPAT/60.0
          COOLNT/MIST
          SPINDL/ON,CLW
          FROM/-1.0,-1.0,2.0,60.0
          GOTO/7.0,3.0,2.0,60.0
          GODLTA/0.0,0.0,.1,20.0
          OPSTOP
          CUTPTS
          RFTPCT
          GOTO/-1.0,-1.0,2.0,60.0
          COOLNT/OFF
          SPINDL/OFF
          STOP
          END
```

```
          FINI
     0
R
PARTNO    TX 23.WING
          MACHIN/SUNTRN
          PTONLY/2
          FINI
```

```
          WINGLET KUHLMAN   1/4 MILL 6/4/79 JMK
C
    1
         0
         1          6          1          6
0.0        0.0        0.9051     0.489151   1.8098     0.978070
2.2931     1.661108   3.3311     3.12814    3.8856     3.912094
3.912094   0.0        3.36690    0.489151   3.53980    0.978070
3.78134    1.661108   4.30011    3.12814    4.57720    3.912094
    3    6   30     00.0       0.0        0.0        0.0        1.0
0.0        0.489151   0.978070   1.661108   3.12814    3.912094
00000
111111
  0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
 17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
 35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
 60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
 95.000000100.000000
  -.020809   .038160   .070060   .096184   .117308   .134743   .149040
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  -.032924  -.026359  -.019255  -.012026  -.005188   .000448   .004557
   .005859  -.010000
  0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
 17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
 35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
 60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
 95.000000100.000000
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   .028627   .010000
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  -.042408  -.041822  -.041068  -.040568  -.040032  -.039649  -.039199
  -.038682  -.037930  -.037275  -.036094  -.034580  -.030785  -.026188
  -.020996  -.015410  -.009626  -.003981   .001114   .004985   .007357
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 17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
 35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
 60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
 95.000000100.000000
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Input Deck for Numerically Controlled (NC) Machining of Winglet

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  .025862    .010000
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 -.039327   -.037592   -.035789   -.034214   -.032662   -.031267   -.029875
 -.028488   -.026988   -.025610   -.023918   -.022049   -.017948   -.013529
 -.008946   -.004355    .000094    .004141    .007479    .009573    .010193
  .005862   -.010000
 0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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  .078787    .074604    .068944    .061901    .053597    .043998    .032962
  .023073    .010000
 -.058118   -.070351   -.070081   -.068409   -.066573   -.064804   -.062684
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 -.045442   -.043031   -.040699   -.038083   -.035312   -.029489   -.023483
 -.017472   -.011625   -.006093   -.001111    .003056    .005959    .007423
  .003073   -.010000
 0.000000  2.500000  5.000000  7.500000 10.000000 12.500000 15.000000
17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
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  .016416    .010000
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 -.021485   -.016909   -.012428   -.008190   -.004363   -.001223   -.000558
 -.003584   -.010000
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17.500000 20.000000 22.500000 25.000000 27.500000 30.000000 32.500000
35.000000 37.500000 40.000000 42.500000 45.000000 50.000000 55.000000
60.000000 65.000000 70.000000 75.000000 80.000000 85.000000 90.000000
95.000000100.000000
 -.043121   -.030016   -.024042   -.018481   -.013677   -.009409   -.005664
 -.002252    .001007    .003885    .006548    .008951    .011168    .013155
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  .021173    .020406    .019121    .017370    .015213    .013825    .013734
  .012881    .010000
```

```
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   -.040010  -.038724  -.037435  -.035974  -.034402  -.031006  -.027365
   -.023560  -.019665  -.015749  -.011913  -.008273  -.006175  -.006266
   -.007119  -.010000
     3
          26          1          0
0.0         4.0        8.0        12.0       16.0       20.0       24.0
28.0        32.0       36.0       40.0       44.0       48.0       52.0
56.0        60.0       64.0       68.0       72.0       76.0       80.0
84.0        88.0       92.0       96.0       100.0
          25          1          0
1.0         5.0        9.0        13.0       17.0       21.0       25.0
29.0        33.0       37.0       41.0       45.0       49.0       53.0
57.0        61.0       65.0       69.0       73.0       77.0       81.0
85.0        89.0       93.0       97.0
          25          1          0
2.0         6.0        10.0       14.0       18.0       22.0       26.0
30.0        34.0       38.0       42.0       46.0       50.0       54.0
58.0        62.0       66.0       70.0       74.0       78.0       82.0
86.0        90.0       94.0       98.0
          25          0          0
3.0         7.0        11.0       15.0       19.0       23.0       27.0
31.0        35.0       39.0       43.0       47.0       51.0       55.0
59.0        63.0       67.0       71.0       75.0       79.0       83.0
87.0        91.0       95.0       99.0
     5
          1          1          1
4.0000      0.0        1.511      1.0        99.0       0.0        .1255
1.0
          0
     6
PARTNO    WINGLET KUHLMAN   1/4 MILL 6/4/79 JMK
          MACHIN/SUNTRN,3,,LINEAR
          CLEARP/XYPLAN,3.0
          FEDRAT/60.0
          COOLNT/MIST
          SPINDL/ON,CLW
          FROM/-1.0,-1.0,2.0,60.00
          GOTO/0.0,2.0,1.0,60.0
          GODLTA/0.0,0.0,,1,20.0
          OPSTOP
          CUTPTS
          RETRCT
          GOTO/-1.0,-1.0,2.0,60.0
          COOLNT/OFF
          SPINDL/OFF
          STOP
          END
```

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          FINI
     0
R
PARTNO    TX 23.WING
          MACHIN/SUNTRN
          PTONLY/2
          FINI
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15. Supplementary Notes

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16. Abstract

The aerodynamic design of a wind-tunnel model of a wing representative of that of a subsonic jet transport aircraft, fitted with winglets, has been performed using two recently developed optimal wing-design computer programs. Both potential flow codes use a vortex lattice representation of the near-field of the aerodynamic surfaces for determination of the required mean camber surfaces for minimum induced drag, and both codes use far-field induced drag minimization procedures to obtain the required spanloads. One code uses a discrete vortex wake model for this far-field drag computation, while the second uses a 2-D advanced panel wake model. Wing camber shapes for the two codes are very similar, but the resulting winglet camber shapes differ widely. Design techniques and considerations for these two wind-tunnel models are detailed herein, including a description of the necessary modifications of the design geometry to format it for use by a numerically controlled (NC) machine for the actual model construction.

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